User Manual

T3AFG5 and T3AFG10 Series Function/Arbitrary
Waveform Generator

Declaration

General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

To Avoid Fire or Personal Injury

- **Use proper power line. Only the special power line of the products approved by the state should be used.**

- **Ground the instrument. This generator is grounded through the protective terra conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to the earth ground. Make sure that the instrument is properly grounded before connecting the input or output terminals.**

- **Observe all the ratings of the terminal. To avoid fire or shock, observe all the ratings and symbols that marked on the instrument. Read the user guide carefully before making connections to the instrument.**

- **Do not operate without Covers. Do not operate the product with covers or panels removed.**

- **Avoid circuit or wire exposed. Do not touch the exposed connections or components when the power is on.**

- **Do not operate with suspected failures. If you suspect there is damage with this product, you should have it inspected by**

  qualified service personnel authorized by Teledyne Test Tools before further operations.

- **Provide proper ventilation.**

- **Do not operate in wet/damp conditions.**

- **Do not operate in an explosive atmosphere.**

- **Keep the product's surfaces clean and dry.**

- **Not position the equipment so that it is difficult to operate the disconnecting device (detachable plug)**

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Ⓒ **This product has been tested to the requirements of CAN/CSA-C22.2 No. 61010-1, second edition, including Amendment 1, or a later version of the same standard incorporating the same level of testing requirements.**

Not to use the product for measurements within other measurement categories, such as CAT II, CAT III, CAT IV.

Not to use the equipment for measurements on mains circuits, not to use the equipment for measurements on voltage exceed the voltage range describe in the manual.

Only probe assemblies which meet the manufacturer's specifications shall be used.

The Responsible body or operator should refer to the instruction manual to preserve the protection afford by the equipment. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Any parts of the device and its accessories are not allowed to be changed or replaced, other than authorized by the manufacturer of his agent.

Safety Terms and Symbols

This electronic product is subject to disposal and recycling regulations that vary by country and region. Many countries prohibit the disposal of waste electronic equipment in standard waste receptacles. For more information about proper disposal and recycling of your Teledyne LeCroy product,

Terms and Symbols

The following symbols appear on the product or in its documentation:

⚠	**WARNING** High Voltage. Risk of electric shock or burn.
⚠	**WARNING or CAUTION** Condition or practice could result in injury or loss of life, or damage to equipment.
▣	DOUBLE INSULATION
⏚	PROTECTIVE (EARTH) TERMINAL
⚠	Rated for indoor use only. Do not operate where conductive pollutants may be present.

Introduction of T3AFG5-10 Series

The manual covers the following two types of T3AFG5-10 Series Function/Arbitrary Waveform Generators: T3AFG5 and T3AFG10. It does not cover the T3AFG40, T3AFG80 or T3AFG120. They have their own manual.

T3AFG5-10 Series Function/Arbitrary Waveform Generators adopt the direct digital synthesis (DDS) technology, which can provide stable, high-precision, pure and low distortion signals. Its combination of excellent system features, easiness in usage and versatile functions makes this generator a perfect solution for your job now and in the future.

T3AFG5-10 Series Function/Arbitrary Waveform Generator has a clear and simple front-panel. The user-friendly panel layout and instructions, versatile terminals, direct graph interface, built-in instructions and help system have greatly simplified the operation process, with the help of which, users do not have to spend a great deal of time learning and familiarizing the operation of the generator before they can use it proficiently. The built-in AM, DSB-AM,FM, PM, ASK, FSK and PWM modulation functions generate modulated waveforms at ease, without the help of a separate modulating source. USB I/O is a standard accessory, while GPIB is optional. Remote instructions meet the SCPI specification requirements.

From the characteristics and specifications given below, you will understand how T3AFG5-10 can satisfy your requirements.

- **DDS technology provides precise, stable and low distortional output signal.**

- **3.5'TFT color LCD display.**

- **125MSa/s sampling rate, 14-bit resolution.**

- **Frequency characteristics:**

    Sine: 1μHz to 5 MHz / 10 MHz

    Square: 1μHz to 5 MHz / 10 MHz

    Ramp: 1μHz to 300kHz

    Pulse: 500μHz to 5MHz

    White Noise: 5 MHz / 10MHz bandwidth (-3dB)

    Arbitrary: 1μHz to 5MHz

- **5 standard waveforms: Sine, Square, Ramp, Pulse, Noise**

- **Self-defined arbitrary waveform**

- **Multiple modulation function: AM, FM, PM, ASK, FSK, PWM, DSB-AM, Sweep and Burst.**

- **Multiple interfaces: USB host & USB device(USBTMC)**

- **Support USB storage device. Software updating could also be performed using USB devices.**

- **Up to 16k sample points of internal waveform depth, which can rebuild or simulate any complex waveform.**

- **2 languages (English and Chinese) user interface and built-in help system.**

Note:

All the specifications described in this guide are according to T3AFG5-10. If you need to know the particular specifications about the other types, please see the data sheet.

Catalogue

1. Getting Started

This chapter covers the following topics:

- General Inspection

- Handle Adjustment

- The Front/Rear Panel

- To Set a Waveform

- To Set Modulate/Sweep/Burst

- To Set Output

- To Use Digital Input

- To Use Store/Utility/Help Function

1.1. General Inspection

When you get a new T3AFG5-10 Series Function/Arbitrary Waveform Generator, you are suggested to take the following steps to inspect the instrument.

1. **Inspect the shipping container for damage.**

    If there are damages in the packing or foam, keep them until the whole machine and the accessories pass the electric and mechanical testing.

2. **Check the accessories.**

    Accessories supplied with the instrument are listed in chapter 6 'Appendix A: Accessories'.

    If the contents are incomplete or damaged, please notify your sales representative.

3. **Inspect the instrument.**

    In case any mechanical damage or defect, or if the instrument does not operate properly or pass performance tests, notify your sales representative. If the shipping container is damaged, or the cushioning materials show signs of stress, notify the carrier as well as your sales office. Keep the shipping materials for the carrier's inspection. Offices will arrange for repair or replacement at their option without waiting for claim settlement.

1.2. Handle Adjustment

To adjust the handle position of T3AFG5-10 Function/Arbitrary Waveform Generator, please grip the handle by the sides and pull it outward. Then, make the handle rotate to the desired position.
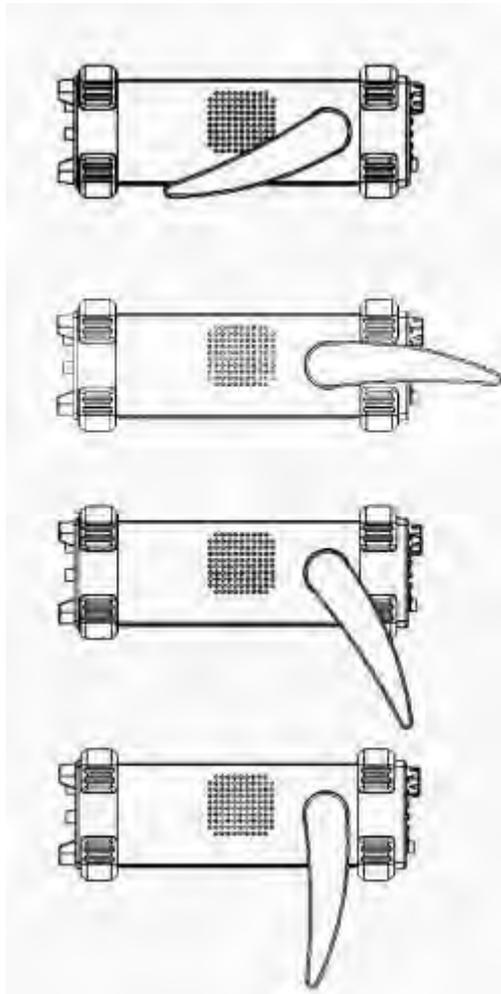
Figure 1- 1 Viewing Position and Carrying Position

1.3.   The Front/Rear Panel

When you get a new T3AFG5-10 Series Function/Arbitrary Waveform Generator, first you need to understand how to operate the front/rear panel correctly. This chapter will make a brief introduction and description for the operation and functions of the front/rear panel.

The T3AFG5-10 Series Function/Arbitrary Waveform Generator has a clear and simple front panel. See Figure 1- 2 and Figure 1- 3. The front panel has a knob and functional keys. The 5 blue grey buttons on the right side of the screen are menu buttons (named F1 to F5 from top to bottom) with the help of which, you can enter different functions menu or have direct specific applications. The signal input and output interfaces are set at the front and rear panels which can help generating multiple arbitrary waveforms. The various interfaces can meet the need of the multiple interface communications.

Figure 1- 2 T3AFG5-10 Series
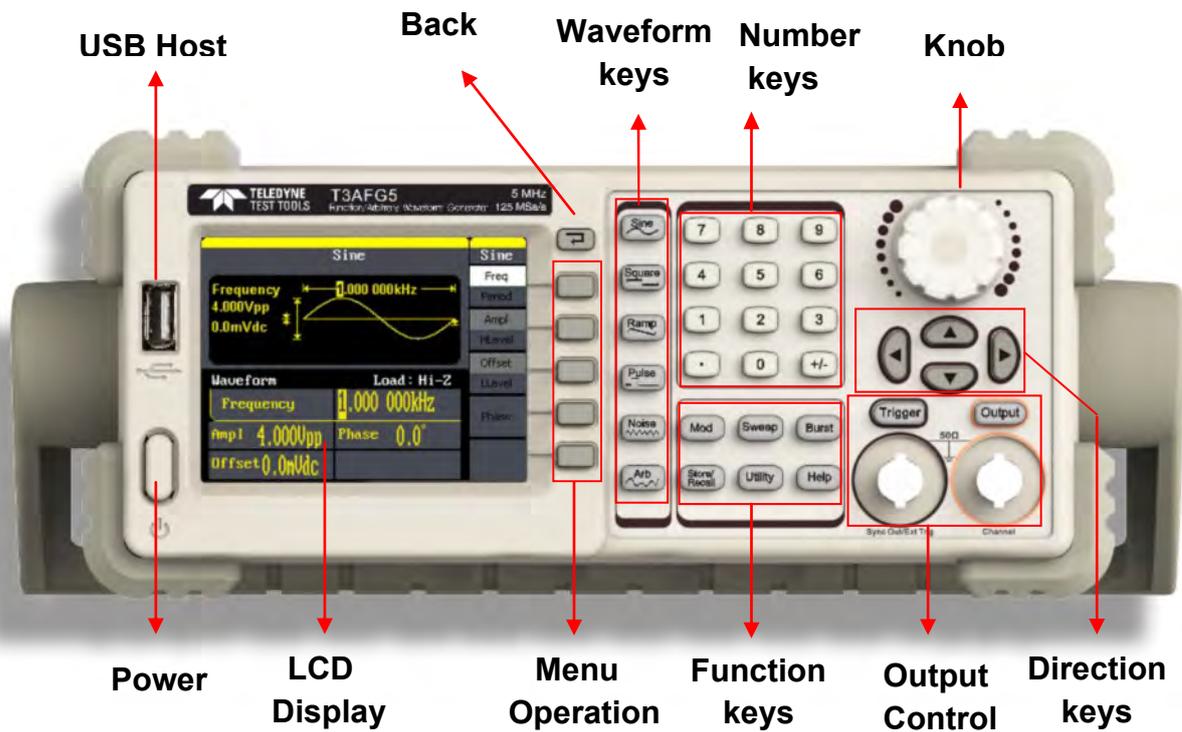
Figure 1- 3 Front Panel of T3AFG5-10 Series
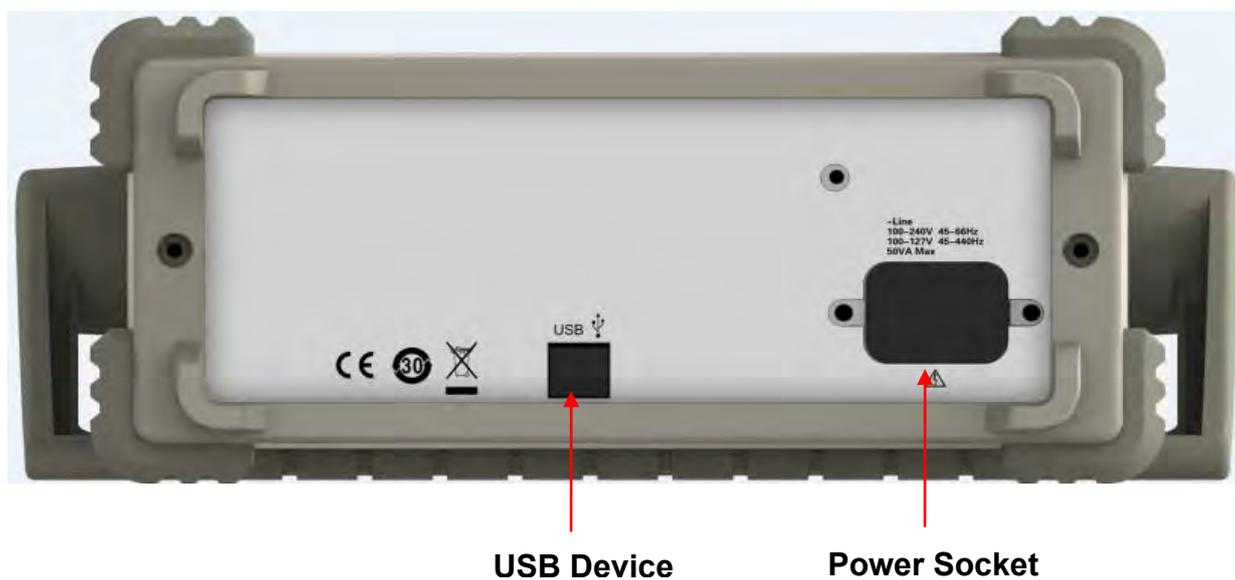
Figure 1- 4 Rear Panel of T3AFG5-10 Series
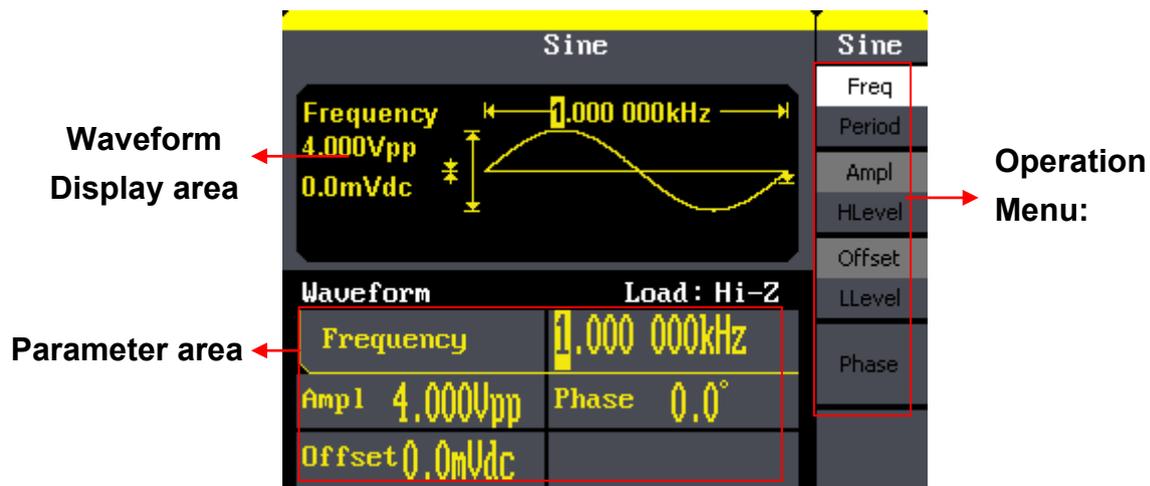
Figure 1- 5 Display Interface (Sine Wave is the default display signal)

Character definitions in this User Manual:

The signs for buttons in this manual are the same as the panel buttons. Please note that, the signs for the functional buttons on the operation panel are represented by squared words, such as $\boxed{\text{Sine}}$, which represents the transparent functional key with Sine on it on the front panel, while the menu buttons are represented by brighten words such as Freq, which means the frequency option in the Sine menu.

1.4. To Set a Waveform

On the operation panel, there is a set of buttons with waveform icon. See Figure 1- 6. The exercise below will help you familiarize with the waveform selection settings.

Figure 1- 6 Waveform Selection Buttons

1. Press Sine button and the waveform window will display sine waveform.

   T3AFG5-10 Series Generator can generate sine signal with a frequency from 1μHz to 30MHz. By setting frequency/period, amplitude/high level, offset/low level, sine signal with different parameters can be generated.

Figure 1- 7 Sine Signal Display Interface

As is shown in Figure 1- 7, the default signal parameters are: 1kHz frequency, 4.0Vpp amplitude and 0Vdc offset.

2. Press [Square] button, and the waveform window displays square waveform. T3AFG5-10 Series Generator can generate square signal with a frequency from 1μHz to 5MHz or 10MHz and variable duty cycle.

Figure 1- 8 Square Signal Display Interface

As is shown in Figure 1- 8, the default signal parameters are: 1kHz frequency, 4.0Vpp amplitude, 0Vdc offset and 50% duty cycle.

3. Press [Ramp] button, and the waveform window displays ramp waveform. T3AFG5-10 Series Generator can generate ramp signal with a frequency of from 1μHz to 300kHz and variable symmetry.

Figure 1- 9 Ramp Signal Display Interface

As is shown in Figure 1- 9, the default signal parameters are: 1kHz frequency, 4.0Vpp amplitude, 0Vdc offset and 50% symmetry.

4. Press Pulse button, and the waveform window displays pulse waveform. T3AFG5-10 Series Generator can generate pulse signal with a frequency from 500µHz to 5 MHz and variable pulse width and delay.
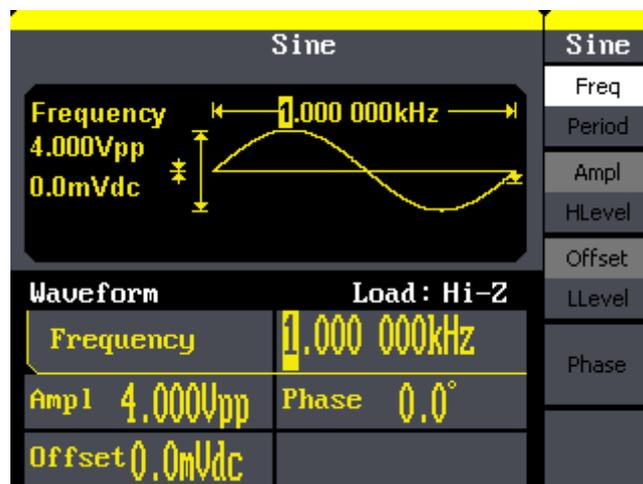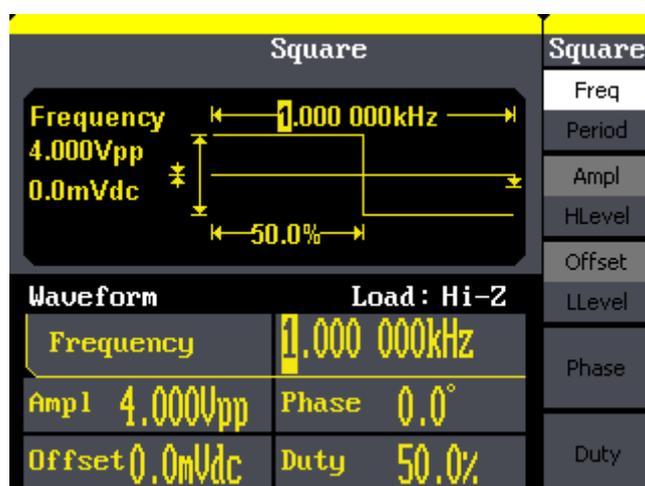

Figure 1- 10 Pulse Signal Display Interface

As is shown in Figure 1-10, the default signal parameters are: 1kHz frequency, 4.0Vpp amplitude, 0Vdc offset, 200μs pulse width.

5. Press Noise button, and the waveform window displays noise waveform. T3AFG5-10 Series Generator can generate noise signal with a band width up to 5MHz or 10MHz depending on the model.
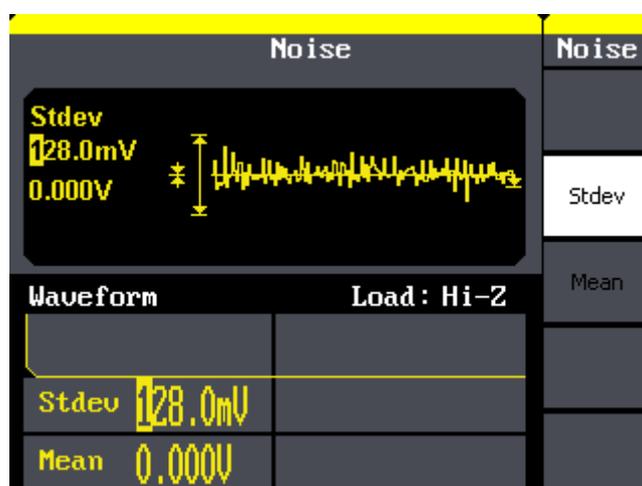
Figure 1-11 Noise Signal Display Interface

As is shown in Figure 1-11, the default signal parameters are: 128mV Stdev and 0V Mean.

6. Press Arb button, and the waveform window displays arbitrary waveform. T3AFG5-10 Series Generator can generate repeatable arbitrary waveform signals with at most 16K points and 5MHz frequency.
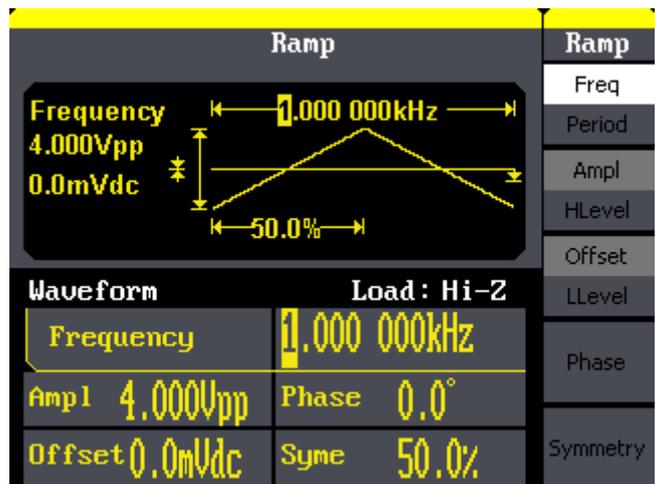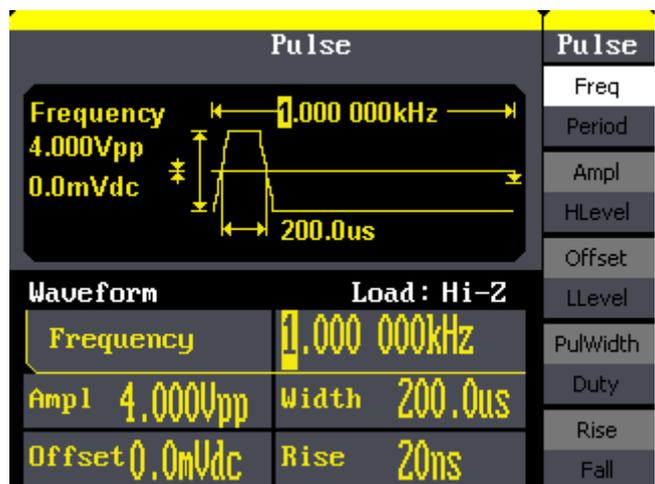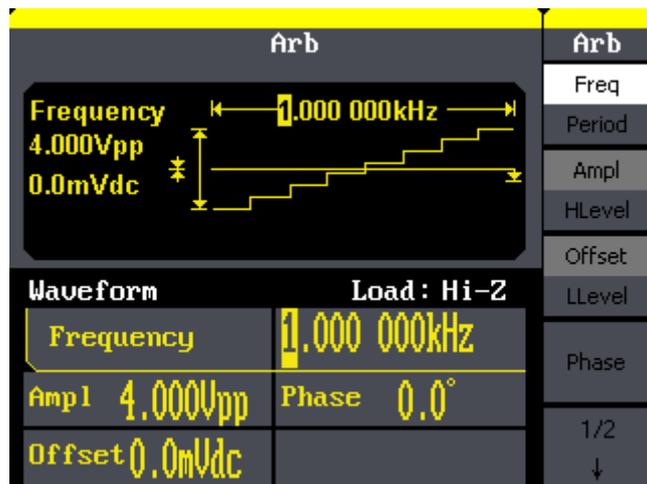
Figure 1-12 Arbitrary Waveform Signal Display Interface

As is shown in Figure 1-12, the default signal parameters are: 1kHz frequency, 4.0Vpp amplitude and 0mVdc offset.

1.5. To Set Modulate/Sweep/Burst

As shown in Figure 1-13, there are three buttons on the front panel, which are used for modulation, sweep and burst settings. The instructions below will help you familiarize yourself with the setting of these functions.
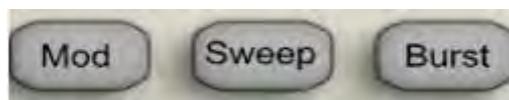
Figure 1- 13 Modulate/Sweep/Burst Button

1. Press Mod button, the modulated waveforms will be generated. The modulated waveform can be changed by modifying the parameters such as type, internal/external modulation, depth, frequency, waveform, etc. T3AFG5-10 Series can modulate waveform using AM, FM, PM, ASK, FSK, PWM and DSB-AM. Sine, square, ramp and arbitrary waveforms can be modulated (pulse, noise and DC can not be modulated).
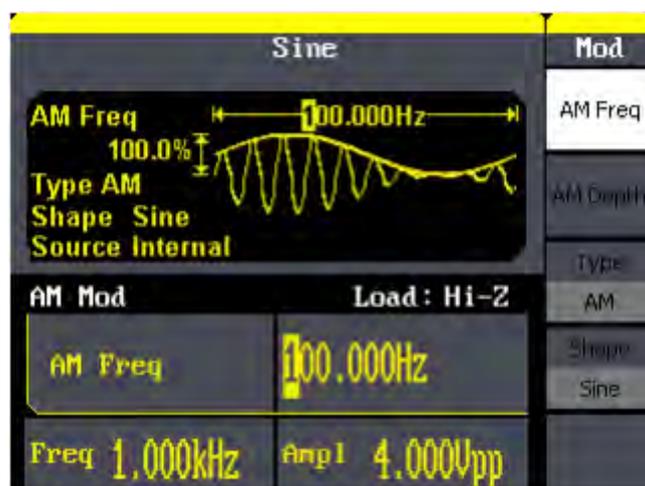
Figure 1-14 Modulated Waveform Display Interface

2. Press [Sweep] button, sine, square, ramp or arbitrary waveform can be swept (pulse, noise and DC can not be swept).

   In the sweep mode, T3AFG5-10 Series generate signal with variable frequencies.
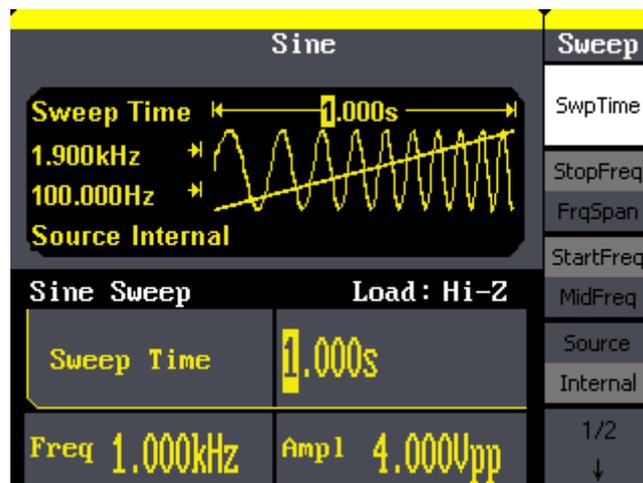
Figure 1-15 Sweep Waveform Display Interface

3. Press [Burst] button, burst for sine, square, ramp, pulse or arbitrary waveform can be generated.
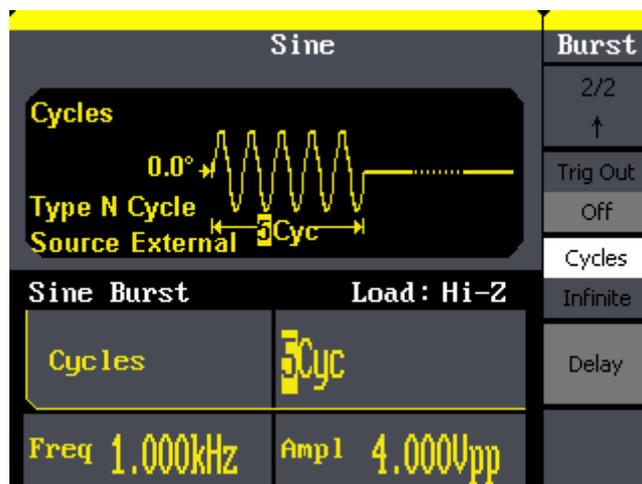
Figure 1-16 Burst Waveform Display Interface

1.6. To Set Output

As is shown in Figure 1-17, there are two buttons on the right side of the operating panel, which are used for output/trigger control. The instructions below will help you familiarize with these functions.

Figure 1-17 Output Buttons

Press Output button, to activate or deactivate the output signal.

1.7. To Use Digital Input

As is shown in Figure 1-18, there are three sets of buttons on the operating panel, which are direction buttons, the knob and the keypad. The instruction below will help you familiarize yourself with the digital input function.

Figure 1-18 Front Panel Digital Input

1. The up and down keys are used to shift parameters and the left and right keys are used to shift digits.

2. Keypad is used to directly set the parameters value.

3. Knob is used to change a signal digit value whose range is 0~9.

1.8. To Use Store/Utility/Help Function

As is shown in Figure 1-19, there are three buttons on the operating panel, which are used to call the store/recall, utility and help function. The instruction below will help you familiarize yourself with these functions.

Figure 1- 19 Store/Recall Utility and Help Button

1. The Store/Recall button is used to store waveform data and configure information.

2. The Utility button is used to set the auxiliary system function, change the output configure parameters, interface setting, system setting information or perform the instrument self-test and read the calibration information, etc.

3. The Help button is used to read the help information.

2. Operating Your Generator

Up to now you have got a brief understanding about T3AFG5-10 series with the front/rear panel, every function control area and keys. You should also know how to set your Function/Arbitrary Waveform Generator for your usage. If you are not familiar with these operations, you are suggested to read chapter one 'Getting Started' again.

This chapter covers the following topics:

■   Setting Sine Signal   (Sine)

■   Setting Square Signal   (Square)

■   Setting Ramp Signal   (Ramp)

■   Setting Pulse Signal   (Pulse)

■   Setting Noise Signal   (Noise)

■   Setting Arb Signal   (Arb)

■   Output Modulated Signal (Mod)

■   Output Sweep Signal   (Sweep)

■   Output Burst Signal   (Burst)

■   Store/Recall   (Store/Recall)

■   Utility Setting   (Utility)

■   Help System   (Help)

You are suggested to read this chapter carefully so as to understand T3AFG5-10 Series Generator's versatile waveform setting functions and more operation methods.

2.1. To Set Sine Signals

Press [Sine] button to call the sine operation. The sine waveform parameters are set by using the sine operation menu.

The parameters of sine waveforms are: frequency/period, amplitude/high level, offset/low level and phase. Different sine signals are generated by setting these parameters. As is shown in Figure 2- 1, in the soft key menu, select Freq. Cursor is located in the frequency parameter area in the parameter display window, and users can set the frequency value here.
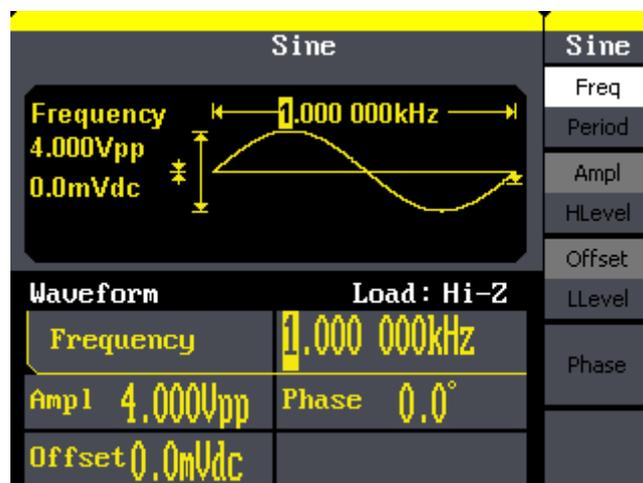
Figure 2- 1 Sine Parameter Display Interface

Figure 2- 2   Table2- 1 Menu Explanations of Sine Waveform
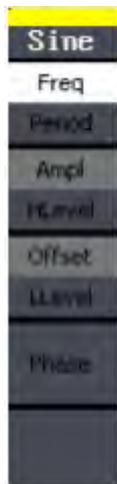
Function menu	Explanations
Freq/ Period	Set the signal frequency or period; The current parameter will be switched at a second press.
Ampl/ HLevel	Set the signal amplitude or high level; The current parameter will be switched at a second press.
Offset/ LLevel	Set the signal offset or low level; The current parameter will be switched at a second press.
Phase	Set the phase of the signal;

To Set the Output Frequency/Period

1. Press Sine →Freq, to set the frequency parameter.

    The frequency shown on the screen when the instrument is powered is

    the default value or the set value beforehand. When setting the function,

    if the current value is valid for the new waveform, it will be used

    sequentially. If you want to set the period for the waveform, press

    Freq/Period button again, to switch to the period parameter (the current

    operation is displayed in inverse color).

2. Input the desired frequency.

    Use the keypad to input the parameter value directly, and press the

    corresponding button to select the parameter unit. Or you can use the

    direction button to select the digit you want to edit, and then use the knob

to change its value.
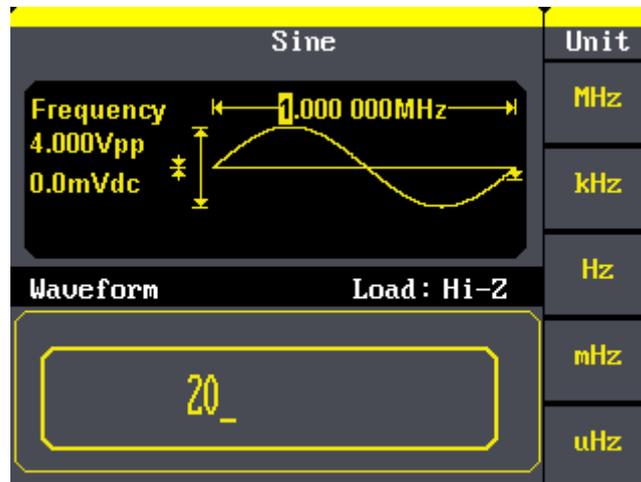
Figure 2-3 Setting the Frequency

Instruction:

When using the keypad to enter the digit, you can use the left direction button to move the cursor backward and delete or change the value of the previous digit.

To Set the Output Amplitude

1. Press Sine →Ampl, to set the amplitude.

   The amplitude shown on the screen when the instrument is powered is the default value or the set value beforehand. When changing the function, if the current value is valid for the new waveform, it will be used sequentially. If you want to set the waveform by high level or low level, press the Ampl/HLevel or Offset/LLevel button again, to switch into the high level or low level parameter (the current operation is displayed in

inverse color).

2. Input the desired Amplitude

    Use the keypad or the knob to input the desired value, choose the unit, and press the corresponding button.

Figure 2-4 Setting the Amplitude

To Set the Output Offset

1. Press Sine →Offset, to set the offset.

    The offset shown on the screen when the instrument is powered is the default value or the set value beforehand. When changing the function, if the current value is valid for the new waveform, it will be used sequentially.

2. Input the desired Offset

    Use the keypad or the knob to input the desired value, choose the unit, and press the corresponding button.
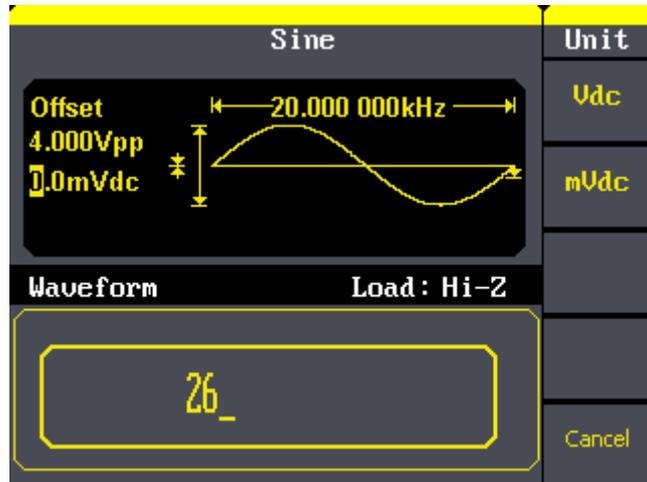
Figure 2-5 Setting the Offset

2.2. To Set Square Signals

Press Square button to call the Square operation. The square waveform parameters are set by using the Square operation menu.

The parameters of Square waveforms are: frequency/period, amplitude/high level, offset/low level, phase and duty. As is shown in Figure 2- 6, select Duty. Cursor is located in the duty parameter area in the parameter display window, and users can set the duty value here.

Figure 2- 6 Square Parameter Display Interface

Figure 2- 7

Table2- 2 Menu Explanations of Square Waveform

Function Menu	Settings	Explanation
Freq/ Period		Set the signal frequency or period; The current parameter will be switched at a second press.
Ampl/ HLevel		Set the signal amplitude or high level; The current parameter will be switched at a second press.
Offset/ LLevel		Set the signal offset or low level; The current parameter will be switched at a second press.
Phase		Set the phase of the signal;
Duty		Set the duty cycle for square waveform.

Term Explanation:

Duty Cycle: The percentage that the high level takes up the whole period.

Please Note : for the Frequency Duty Cycle Value

Below 10MHz: 20% to 80%

To Set the Duty Cycle

1   Press Square →Duty, to set the duty cycle.

The duty cycle shown on the screen when the instrument is powered is the default value or the set value beforehand. When changing the function, if the current value is valid for the new waveform, it will be used sequentially.

2   Input the desired Duty Cycle

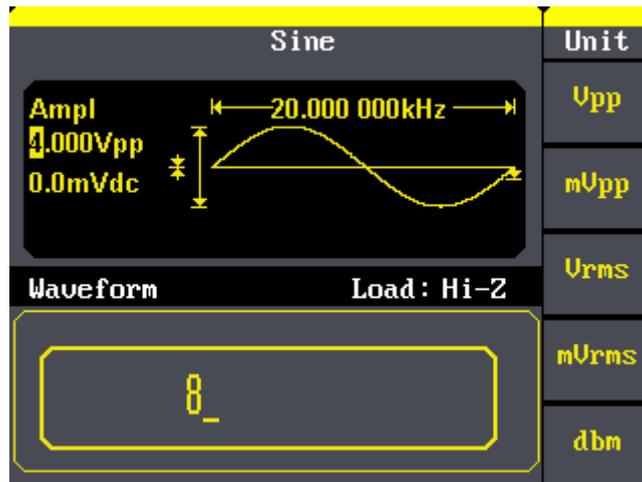Use the keypad or the knob to input the desired value, choose the unit, and press the corresponding button. The generator will change the waveform immediately.
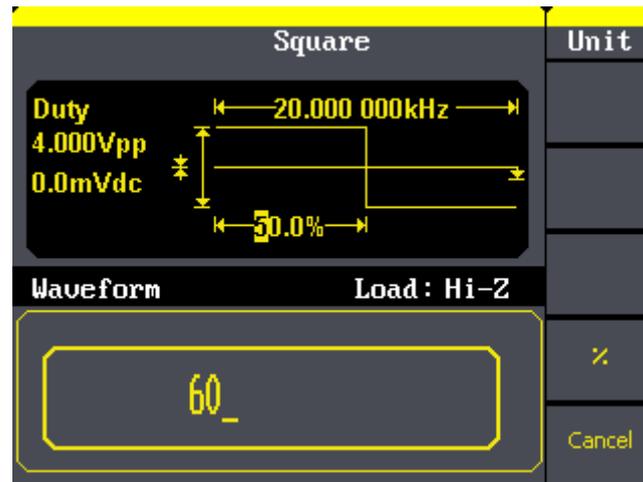
Figure 2- 8 Setting the Duty Cycle

2.3. To Set Ramp Signals

Press [Ramp] button to call the ramp operation. The ramp waveform parameters are set by using the ramp operation menu.

The parameters for ramp waveforms are: frequency/period, amplitude/high level offset/low level, phase and symmetry. As is shown in Figure 2-9, in the soft key menu, select Symmetry. Cursor is located in the symmetry parameter area in the parameter display window, and users can set the symmetry value here.
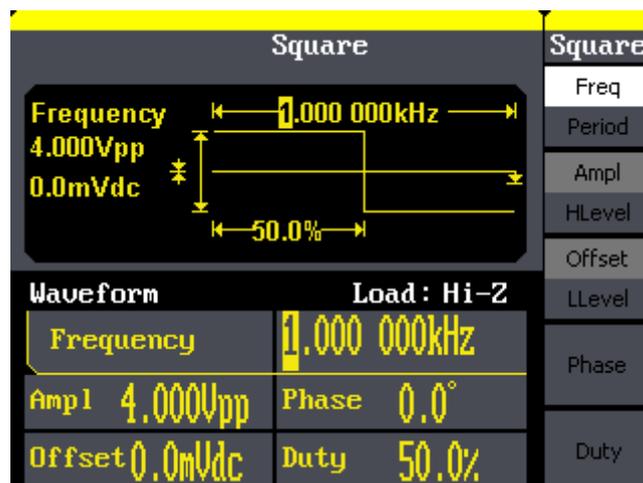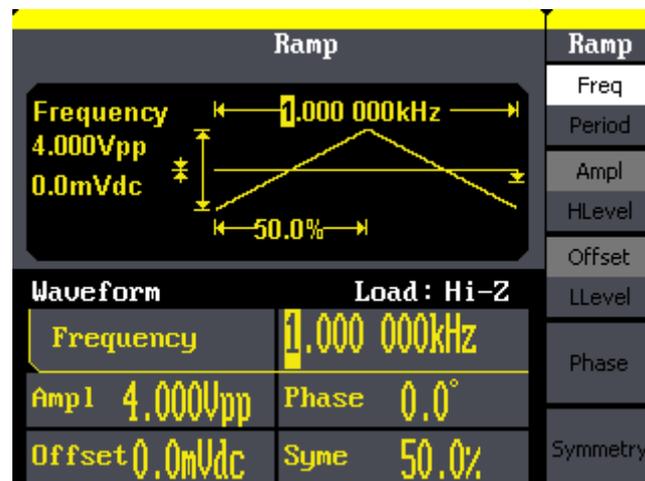

Figure 2- 9 Ramp Parameter Display Interface

Figure 2-10   Table2-3 Menu Explanations of Ramp Waveform

Function Menu	Settings	Explanation
Freq/ Period		Set the signal frequency or period; The current parameter will be switched at a second press.
Ampl/ HLevel		Set the signal amplitude or high level; The current parameter will be switched at a second press.
Offset/ LLevel		Set the signal offset or low level; The current parameter will be switched at a second press.
Phase		Set the phase of the signal;
Symmetry		Set the symmetry for ramp waveform.

Term Explanation:

Symmetry: The percentage that the rising period takes up the whole Period.

Input Range: 0~100%.

To Set the Symmetry

1. Press⬚Ramp⬚→Symmetry, to set the symmetry.

    The symmetry shown on the screen when the instrument is powered is the default value or the set value beforehand. When changing the function, if the current value is valid for the new waveform, it will be used sequentially.

2. Input the desired Symmetry

    Use the keypad or the knob to input the desired value, choose the unit, and press the corresponding button. The generator will change the waveform immediately.


Figure 2-11 Setting the Symmetry

2.4. To Set Pulse Signals

Press $\boxed{\text{Pulse}}$ button to call the pulse operation. The pulse waveform parameters are set by using the pulse operation menu.

The parameters for pulse waveforms are: frequency/period, amplitude/high level, offset/low level, pulse width/Duty and Rise/Fall. As is shown in Figure 2- 12, in the soft key menu, select PulWidth. Cursor is located in the pulse width parameter area in the parameter display window, and users can set the pulse width value here.
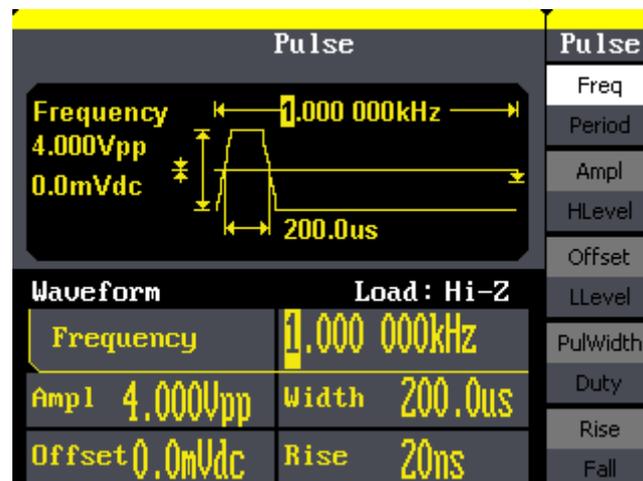
Figure 2- 12 Pulse Parameter Display Interface

Figure 2- 13

Table 2- 4   Menu Explanations of Pulse Waveform

Function Menu	Explanation
Freq/ Period	Set the signal frequency or period; The current parameter will be switched at a second press.
Ampl/ HLevel	Set the signal amplitude or high level; The current parameter will be switched at a second press.
Offset/ LLevel	Set the signal offset or low level; The current parameter will be switched at a second press.
PulWidth /Duty	Set the signal pulse width or duty; The current parameter will be switched at a second press.
Rise / Fall	Setting the rising edge for pulse waveform. Setting the falling edge for pulse waveform

Term Explanation:

Pulse Width:

Positive Pulse Width: the time span between thresholds of 50% of the rising edge amplitude to the next 50% of the falling edge amplitude;

Negative Pulse Width: the time span between thresholds of 50% of the falling edge amplitude to the next 50% of the rising edge amplitude.

To Set the Pulse Width

1.   Press Pulse →PulWidth, to set the pulse width.

The pulse width shown on the screen when the instrument is powered is the default value or the set value beforehand. When changing the function, if the current value is valid for the new waveform, it will be used sequentially.

2. **Input the desired Pulse Width**

Use the keypad or the knob to input the desired value, choose the unit, and press the corresponding button. The Generator will change the waveform immediately.
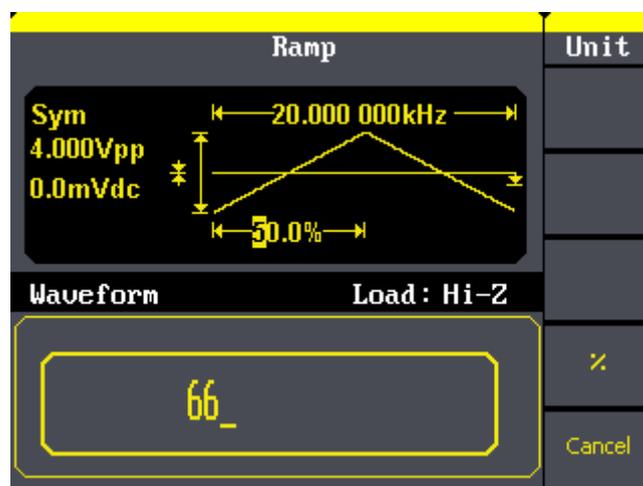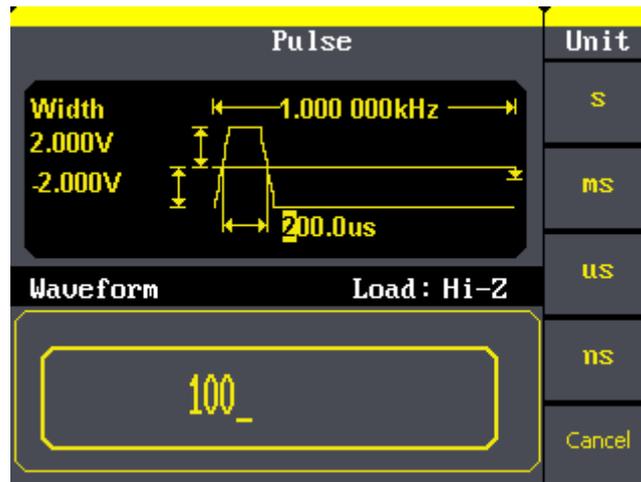

Figure 2- 14 Setting the Pulse Width

To Set the Rising Edge

1. Press Pulse →Rise, to set the Rise edge.

The rising edge shown on the screen when the instrument is powered is the default value or the set value beforehand. When changing the function, if the current value is valid for the new waveform, it will be used sequentially.

2. Input the desired rising edge

Use the keypad or the knob to input the desired value, choose the unit, and press the corresponding button. The generator will change the waveform immediately.
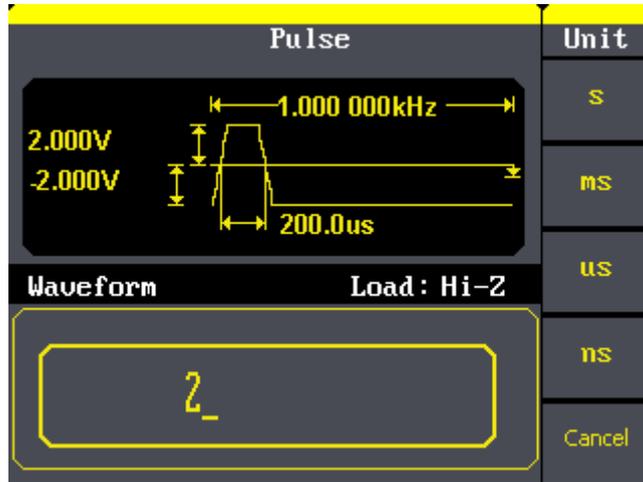
Figure 2-15 Setting the Rise edge

2.5. To Set Noise Signals

Press [Noise] button to call the Gaussian White noise operation. The noise waveform parameters are set by using the noise operation menu.

The parameters for noise waveforms are: Stdev and mean. As is shown in Figure 2- 16, in the soft key menu, select Stdev, Cursor is located in the Stdev parameter area in the parameter display window, and users can set the Stdev value here. Noise is non-regulated signal which has no frequency or period.
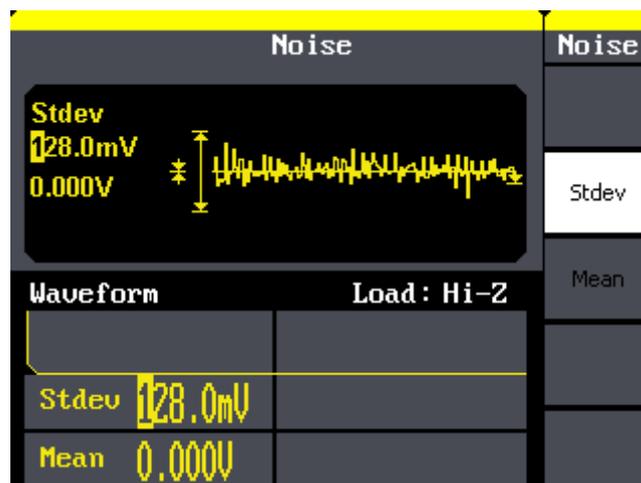
Figure 2-16 Noise Parameter Display Interface

Figure 2- 17   Table 2-5 Menu Explanations of Noise Waveform

Function Menu	Settings	Explanation
Stdev		Set the signal standard deviation
Mean		Set the signal mean

2.6. To Set Arbitrary Signals

Press⎡Arb⎤button to call the Arb operation. The Arb waveform parameters are set by using the Arb operation menu.

The Arb signal consists of two types: the system built-in waveform and the user-definable waveform. The parameters for Arb waveforms are: frequency/period, amplitude/high level, offset/ low level and phase.
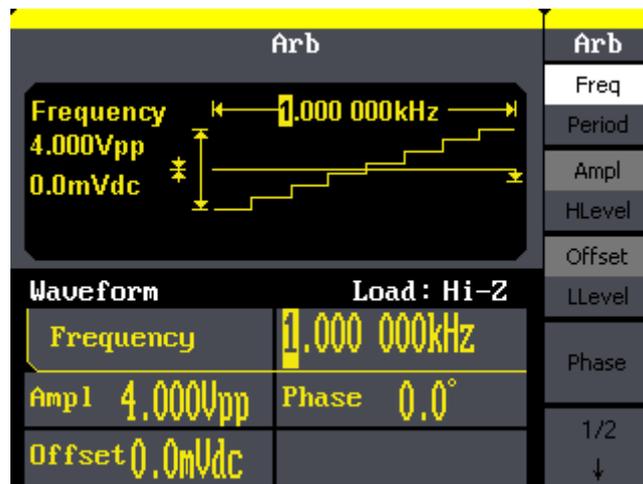
Figure 2-18 Arb Parameter Display Interface

Figure 2-19   Table 2-6 Menu Explanations of Arb Waveform (Page 1/2)

Function Menu	Settings	Explanation
Freq/ Period		Set the signal frequency or period; The current parameter will be switched at a second press.
Ampl/ HLevel		Set the signal amplitude or high level; The current parameter will be switched at a second press.
Offset/ LLevel		Set the signal offset or low level; The current parameter will be switched at a second press.
Phase		Set the phase of the signal;

Figure 2-20   Table 2- 7 Menu Explanations of Arb Waveform (Page 2/2)
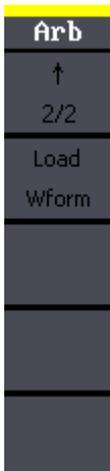
Function Menu	Settings	Explanation
Load Wform		Select the built-in arbitrary signal as output.

To select the built-in Arbitrary Waveform

There are forty-eight built-in Arbitrary Waveforms and user-definable Arbitrary Waveforms inside the Generator. To select one of them, follow the instructions below:

Press Arb →Load Wform, to enter the interface below.

Figure 2- 21   Table 2- 8 Menu Explanations of Built-in Arbitrary Waveform

Function Menu	Settings	Explanation
Built-In		Select one of the 46 types built-in arbitrary waveforms.
Stored Wforms		Select one of arbitrary waveforms stored in the non-volatile memory.
Cancel		Cancel the current operation, and return to the upper menu (the followings are the same and will not be explained).

1. To Select the Built-in Waveform

Press Arb →Load Wform->Built-In, and enter the following interface.

As is shown in Figure 2-22, there are five kinds of arbitrary waveform.

Figure 2-22

Table 2-9 Menu Explanations of Built-In Arbitrary Waveform

Function Menu	Settings	Explanation
Common		Select common waveform.
Math		Select math waveform.
Project		Select project waveform.
Winfun/ Triangle		Select windows function /triangle waveform.
Select		Validate the built-in waveform.

Figure 2-23 Common Built-In Arbitrary Waveform interface

Table 2-10 Menu Explanations of Common Built-In Arbitrary Waveform

Function Menu	Settings	Explanation
StairUp		Select the built-in stair up waveform.
StairDn		Select the built-in stair down waveform.
StairUD		Select the built-in stair up and down waveform.
PPulse		Select the built-in positive pulse waveform.
NPulse		Select the built-in negative pulse waveform.
Trapezia		Select the built-in trapezoid waveform
UpRamp		Select the built-in up ramp waveform.
DnRamp		Select the built-in down ramp waveform.

Figure 2-24 Math Built-In Arbitrary Waveform Interface

Table 2-11 Menu Explanations of Math Built-in Arbitrary Waveform

Function Menu	Settings	Explanation
ExpFall		Select the built-in exponential fall waveform.
ExpRise		Select he built-in exponential rise waveform.
LogFall		Select the built-in logarithmic fall waveform.
LogRise		Select the built-in logarithmic rise waveform.
Sqrt		Select the built-in square root waveform.
Root3		Select the built-in Root3 waveform.
X^2		Select the built-in X^2 waveform.
X^3		Select the built-in X^3 waveform.
Sinc		Select the built-in sinc waveform; Sinc sin(x)/x.
Gaussian		Select the built-in gaussian waveform.
Dlorentz		Select the built-in D-lorentz waveform.
Haversin		Select the built-in haversine waveform.
Lorentz		Select the built-in lorentz Waveform.
Gauspuls		Select the built-in gaussian-modulated sinusoidal pulse waveform.
Gmonpuls Tripuls		Select the built-in Gaussian monopulse waveform.
		Select the built-in triangle pulse waveform.

Figure 2-25 Project Built-In Arbitrary Waveform interface

Table 2-12 Menu Explanations of Project Built-in Arbitrary Waveform

Function Menu	Settings	Explanation
Cardiac		Select the built-in electrocardiogram (ECG) signal waveform.
Quake		Select the built-in loma prieta earthquake waveform.
Chirp		Select the built-in swept-frequency cosine waveform.
TwoTone		Select the built-in two tone signal waveform.
SNR		Select the built-in sin wave with white noise waveform.

Figure 2-26 Winfun/Triangle Built-In Arbitrary Waveform interface

Table 2- 13 Menu Explanations of Winfun/Triangle Built-in Arbitrary Waveform

Function Menu	Settings	Explanation
Hamming		Select the built-in hamming window waveform.
Hanning		Select the built-in hanning window waveform.
Kaiser		Select the built-in kaiser window waveform.
Blackman		Select the built-in blackman windows waveform.
Gaussian		Select the built-in gaussian window waveform.
Triangle		Select the built-in triangle window waveform.
Hairs		Select the built-in hairs window waveform.
Bartlett		Select the built-in bartlett window waveform.
Tan		Select the built-in tangent waveform. Cot
		Select the built-in cotangent waveform.
Sec		Select the built-in secant waveform. Csc
		Select the built-in cosecant waveform
Asin		Select the built-in inverse sine waveform.
Acos		Select the built-in inverse cosine waveform.

Atan		Select the built-in tangent waveform.
Acot		Select the built-in inverse cotangent waveform.

2. To Select the Stored Waveform

Press Arb →Load Wform->Stored Wforms, and enter the following interface.

As is shown in Figure 2-27, use the direction keys or knob to choose the corresponding arbitrary waveform and press Select.

Figure 2-27 Stored Wform Display Interface

2.7. To Generate the Modulated Waveform

Use the $\boxed{\text{Mod}}$ button to generate modulated waveform. T3AFG5-10 Series can generate AM, FM, ASK, FSK, PM, PWM and DSB-AM modulated waveforms. Modulating parameters vary with the types of the modulation. In AM, users can set the depth, modulating frequency, modulating waveform and carrier waveform; In FM, users can set the modulating frequency, frequency deviation, modulating waveform and carrier waveform; In ASK, users can set the Key Freq and carrier waveform; In FSK, users can set the key frequency, Hop Freq and carrier waveform; In PM, users can set the phase deviation, modulating frequency, modulating waveform and carrier waveform. We will cover how to set these parameters in details according to the modulation types.
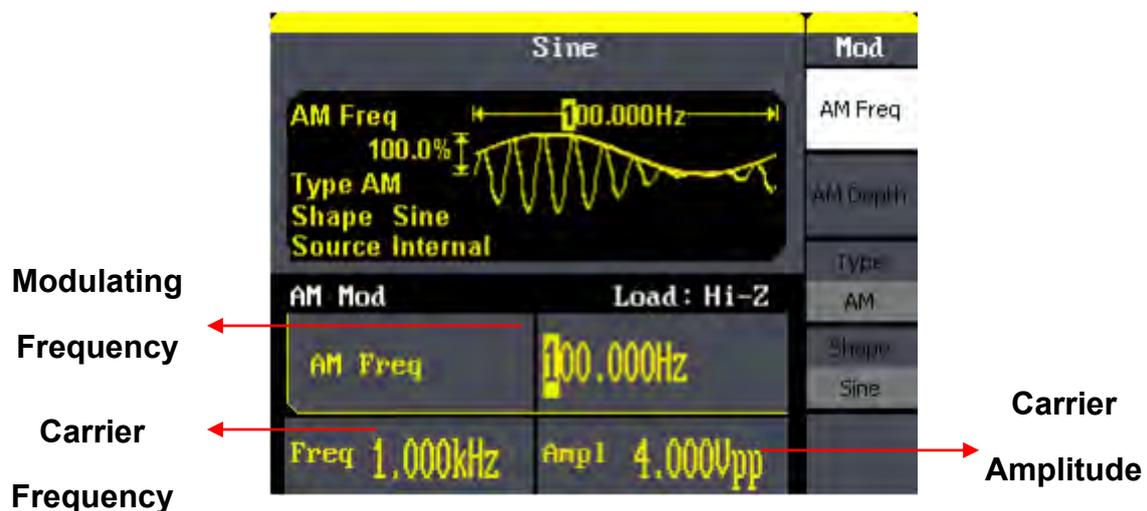

Figure 2- 28 Display Interface of Modulated Waveform Parameter

AM

The modulated waveform consists of two parts: the carrier waveform and the modulating waveform. In AM, the amplitude of the carrier waveform varies with the instantaneous voltage of the modulating waveform. The parameters for the AM are in Figure 2-29

Press Mod →Type→ AM, to enter the following menu.

Figure 2-29   Table 2-14 Menu Explanations of the AM Parameters
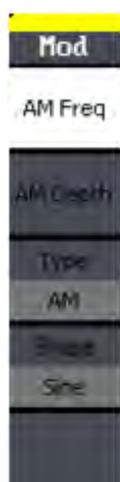
Function Menu	Settings	Explanation
AM Freq		Set the modulating waveform frequency. Frequency range: 2mHz~20kHz (internal source only).
AM Depth		Set the amplitude range.
Type	AM	Amplitude modulation.
Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Choose the modulating waveform. To change the carrier waveform parameter, press Sine, Square, Ramp, Arb

Term Explanation

Modulation Depth

The amplitude range (also called 'Percentage Modulation'). Modulation depth varies from 0% to 120%.

- **In the 0% modulation, the output amplitude is the half of the set value.**
- **In the 100% modulation, the output amplitude is the same as the set value.**

FM

The modulated waveform consists of two parts: the carrier waveform and the modulating waveform. In FM, the frequency of the carrier waveform varies with the instantaneous voltage of the modulating waveform. The parameters for the FM are as shown in Figure 2-30.

Figure 2-30 Setting Interface of FM Waveform Parameter

Press　Mod →Type→ FM, to enter the following menu.

Figure 2-31　　　　　　　Table 2-15 Menu Explanations of the FM Parameters

Function Menu	Settings	Explanation
FM Freq		Set the modulating waveform frequency. Frequency range 2mHz~20kHz (internal source).
FM Dev		Set the maximum frequency deviation
Type	FM	Frequency modulation
Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Choose the modulating waveform. To change the carrier waveform parameter, press Sine, Square,　Ramp,　Arb

> **Term Explanation**
>
> **Frequency Deviation**
>
> - **The deviation should be equal to or less than the carrier waveform frequency.**
> - **The sum of the deviation and the carrier frequency should be equal to or less than maximum frequency of the selected function.**

ASK (Amplitude Shift Keying)

ASK is a form of modulation that represents digital data as variations in the amplitude of a carrier wave. The amplitude of an analog carrier signal varies in accordance with the bit stream (modulating signal), keeping frequency and phase constant. The parameters for the ASK are as shown in Figure 2- 32
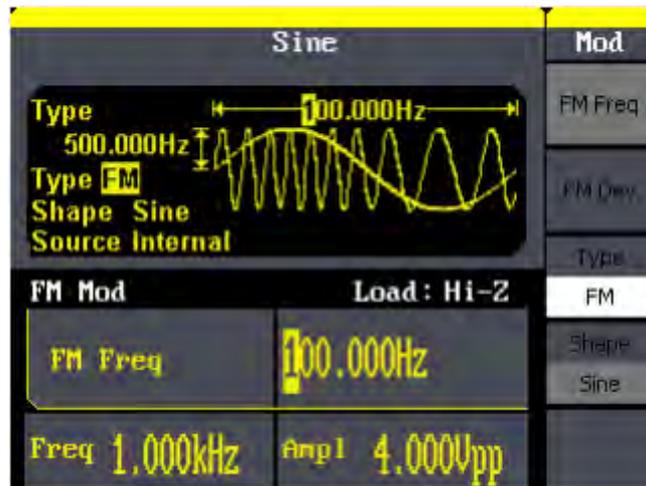

Figure 2-32 Setting Interface of ASK Waveform Parameter

Press Mod →Type→ ASK, to enter the following menu.

Figure 2-33   Table 2-16 Menu Explanations of the ASK Parameters

Function Menu	Settings	Explanation
Key Freq		Set the frequency at which the output amplitude shifts between the carrier amplitude and zero (internal modulation only): 2mHz~50kHz.
Type	ASK	Amplitude shift keying modulation.

FSK (Frequency Shift Keying)

The FSK Modulation is a modulation method, the output frequency of which switches between the two pre-set frequencies (carrier waveform frequency and the hop frequency). The frequency at which the output frequency switches is called the key frequency.
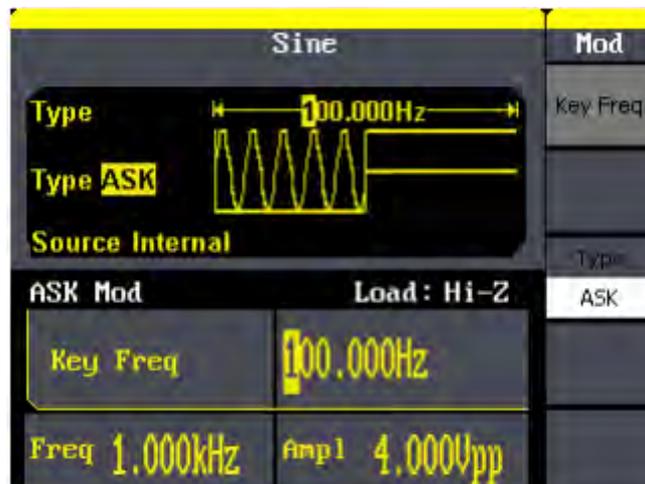

Figure 2- 34 Setting Interface of FSK Waveform Parameter

Press Mod →Type→ FSK, to enter the following interface

Figure 2- 35   Table 2- 17 Menu Explanations of the FSK Parameters

Function Menu	Settings	Explanation
Key Freq		Set the frequency at which the output frequency shifts between the carrier frequency and the hop frequency (internal modulation only): 2mHz~50kHz.
Type	FSK	Frequency shift keying modulation.
Hop Freq		Set the hop frequency.

PM (Phase Modulation)

The modulated waveform consists of two parts: the carrier waveform and the modulating waveform. In PM, the phase of the carrier waveform varies with the instantaneous voltage level of the modulating waveform. The parameters for the PM are as shown in Figure 2- 36.
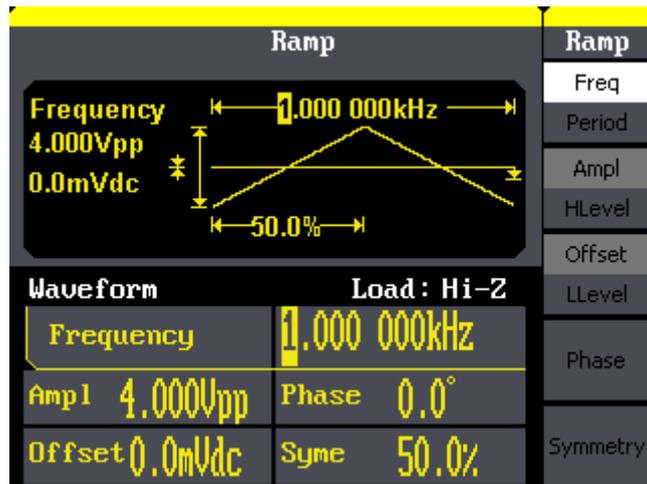

Figure 2- 36 Setting Interface of PM Waveform Parameter

Press⌊Mod⌋→Type →PM, enter the following interface.

Figure 2-37   Table 2-8 Menu Explanations of the PM Parameters

Function Menu	Settings	Explanation
PM Freq		Set the modulating waveform frequency. Frequency range: 2mHz~20kHz
Phase Dev		Range from 0° ~ 360°.
Type	PM	Phase modulation
Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Choose the modulating waveform. To change the carrier waveform parameter, press Sine, Square, Ramp, Arb

PWM (Pulse Width Modulation)

The modulated waveform consists of two parts: the carrier waveform and the modulating waveform, the carrier waveform is only a pulse. In PWM, the pulse width of pulse varies with the instantaneous voltage of the modulating waveform. The parameters for the PMW are as shown in Figure 2-38.
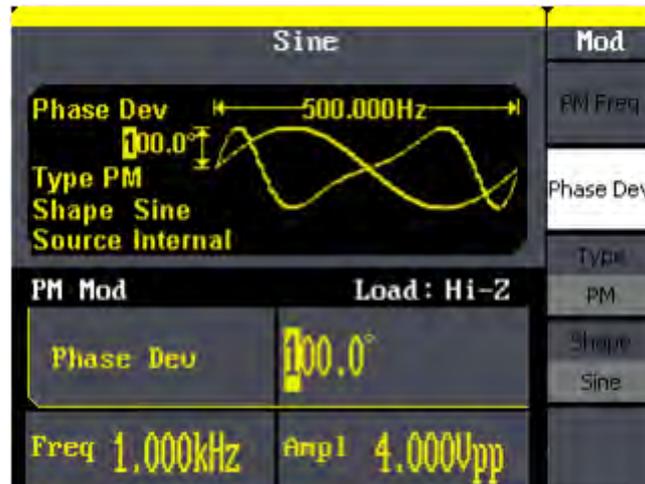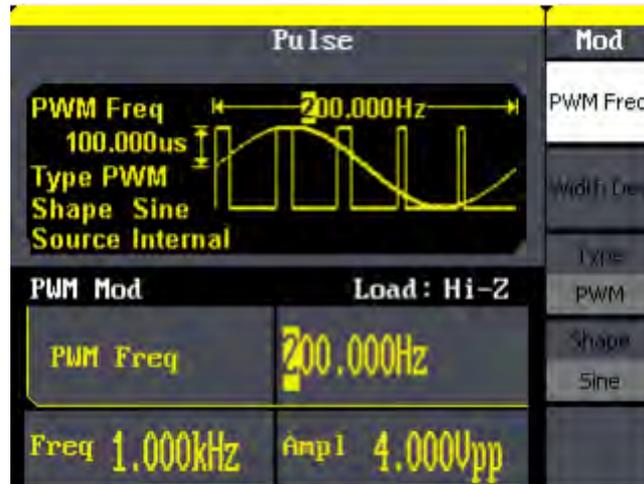

Figure 2-38 Setting Interface of PWM Waveform Parameter

Press Mod→ Pulse →PWM, to enter the following menu.

Figure 2-39   Table 2-19 Menu Explanations of the PWM Parameters
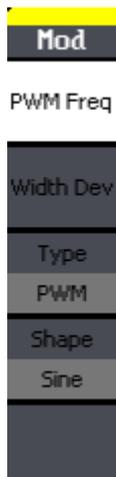
Function Menu	Settings	Explanation
PWM Freq		Set the modulating waveform frequency. 2mHz~20kHz
Width Dev Duty Dev		Set the width or Duty range.
Type	PWM	Amplitude modulation.
Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Choose the modulating waveform. The carrier waveform is pulse.

DSB-AM

Press Mod→ Type →DSB-AM. The parameters for the DSB-AM are as shown in Figure 2- 40.
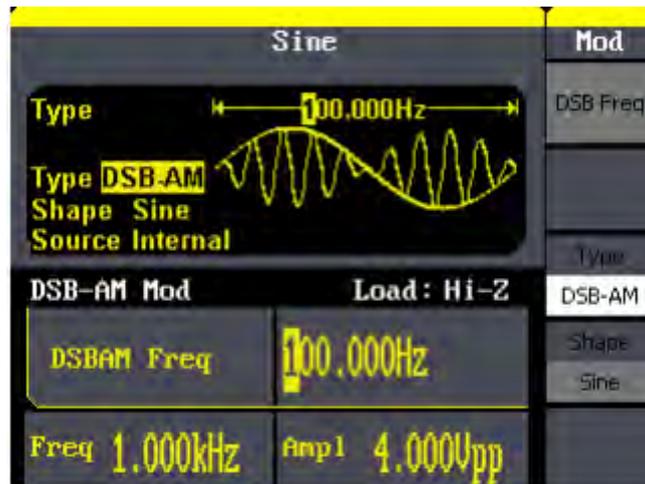
Figure 2- 40 Setting Interface of DSB-AM Waveform Parameter

Figure 2- 41   Table 2- 20 Menu Explanations of the DSB-AM Parameters

Function Menu	Settings	Explanation
DSB Freq		Set the modulating waveform frequency. Frequency range: 2mHz~20kHz
Type	DSB-AM	Amplitude modulation.
Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Choose the modulating waveform. To change the carrier waveform parameter, press Sine, Square, Ramp, Arb

2.8. To Generate a Sweep

In the frequency sweep mode, the function generator 'steps' from the start frequency to the stop frequency at the sweep time you specify. Sweep can be generated by sine, square, ramp or arbitrary waveforms (pulse, noise and DC are not allowed).

Figure 2- 42 Setting Interface of Sweep Waveform Parameter

Press $\boxed{\text{Sweep}}$ button to enter the following menu. Set the waveform parameters by using the operation menu.

Figure 2-43   Table 2-21 Menu Explanations of Waveform Sweep (Page 1/2)

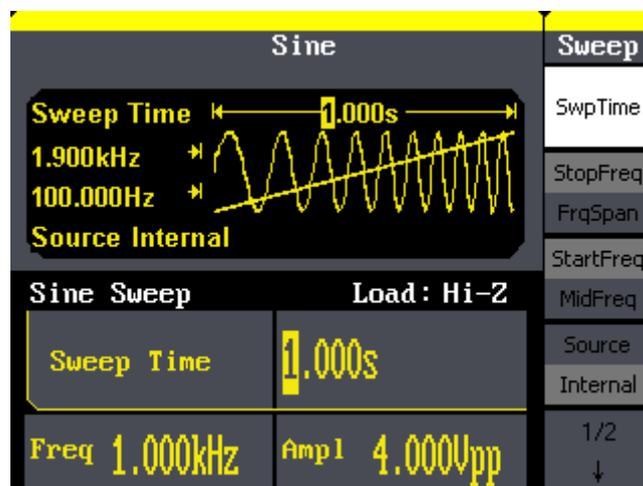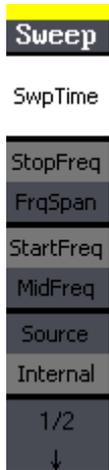| Function Menu	Settings	Explanation
Swp Time		Set the time span of the sweep in which the frequency changes from the start frequency to stop frequency.
Stop Freq Freq Span		Set the stop frequency of the sweep; Set the frequency span of the sweep.
Start Freq Mid Freq		Set the start frequency of the sweep; Set the center frequency of the sweep.
Source	Internal	Choose internal source.
	External	Choose external source.
	Manual	Set the start and stop time by hand.

Sweep Frequency Setting

Use start freq and stop freq or center freq and freq span to set the range of the frequency. Press the button again to switch between each setting.

Figure 2-44   Table 2-22 Menu Explanations of Waveform Sweep (Page 2/2)

Function Menu	Settings	Explanation
Linear/ Log		Set the sweep with linear spacing; Set the sweep with logarithmic spacing.
Direct	↓ ↑	Sweep upward; Sweep downward.

2.9. To Generate a Burst

Burst function can generate versatile waveforms in burst, which can last specific number of waveform cycles (N-Cycle burst), or when external gated signals (gated burst) is applied, any waveform could be used, but noise can only be used in Gated Burst.

Press ⌈Burst⌉ button to enter the following interface. Set the waveform parameters by using the operation menu.
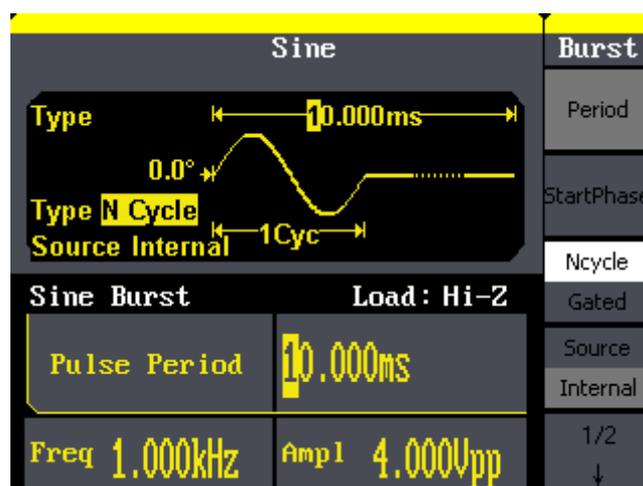
Figure 2- 45 Setting Interface of Burst Waveform Parameter

Set the N-Cycle Burst

Press Burst → N Cycle, to enter the following interface.

Figure 2-46   Table 2-23 Menu Explanations of the N-Cycle Parameters(Page 1/2)

Function Menu	Settings	Explanation
Period		Set the burst Period.
Start Phase		Set the start phase of the burst.
NCycle Gated		Use the N-Cycle mode. Use the Gated mode.
Source	Internal	Choose internal source.
	External	Choose external source.
	Manual	Choose external source, set the start time by hand.

Burst Period

Set the time span between an N-Cycle burst and the next. If necessary the period will increase to allow the specific number of cycles in a burst. Burst Period>Carrier Period × Burst Number

Start Phase

Define the start point in a waveform. The phase varies from 0° to 360°, and the default setting is 0°.   For an Arbitrary Waveform, 0° is the first waveform point.

N-Cycle/Gated

N-Cycle has specific number of waveform cycles, and every burst is activated by a trigger event. Gated burst use external source to control burst when it's activated.

Figure 2-47   Table 2-24 Menu Explanations of the N-Cycle Parameters (Page2/2)

Function Menu	Settings	Explanation
Cycles/ Infinite		Set the number of the bursts in a N-Cycle. Set the number of the bursts in a N-Cycle to be infinite.
Delay		Set the delay time before the burst starts.

Cycles

Set the number of waveform cycle in an N-Cycle (1 to 50,000 or Infinite).

If you choose Infinite, then a continuous waveform will be generated which will not stop until a trigger event happens.

- **If required, Burst Period will increase to cater to the specific number of cycles.**
- **For an infinite-cycle burst, external or manual trigger is needed to activate the burst.**

Delay

Set the time delay between the trigger input and the start of the N-Cycle burst.

The max delay is 240ns.

Set the Gated Burst

Press Burst →Gated, to enter the following interface.

Figure 2- 48   Table 2- 25 Menu Explanations of the Gated Burst Parameters

Function Menu	Settings	Explanation
NCycle Gated		Set the NCycle mode; Set the gated mode.
Polarity	Positive Negative	Set the polarity for the gated signal.

2.10. To Store and Recall

Press $\boxed{\text{Store/Recall}}$ button to enter the following interface. You can save or recall the state documentation inside the generator. The state file on the U Disk can also be recalled or deleted. File names can only be in English. User can only recall or delete the data documentation saved via CSV from the Oscilloscope.
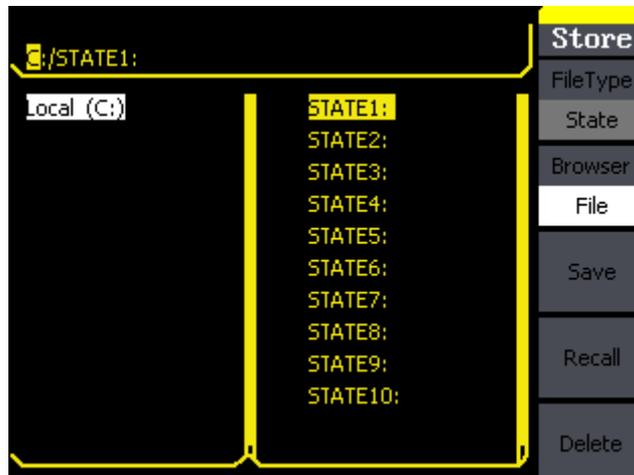
Figure 2- 49 Save and Read Interface

Figure 2-50
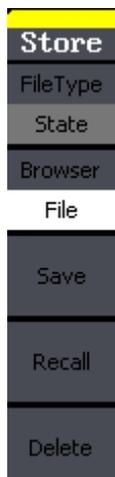
Table 2-26 Menu Explanations of Save and Recall (Page 1/2)

Function Menu	Settings	Explanation
File Type	State Data	The setting of the generator; Arbitrary waveform file;
Browser	Directory File	Shift between the directory and file.
Save		Save the waveform to the appointed place.
Recall		Recall the waveform or setting information in the specific position of the memory.
Delete		Delete the selected file.

About the browser

The directory selection shift is done by the direction keys. In the directory mode, pressing the right key will open the lower directory while the left key will fold the directory. Up and down key are used to shift between the directories;

To Save the Instrument State

Users are allowed to store the instrument state in any of the 10 non-volatile memories. The state storage will 'memorize' the selected function (including the arbitrary waveform, frequency, amplitude, DC offset, duty cycle, symmetry, and other modulation parameter used.)

To save the instrument state, the procedures are given as followed:

1. Choose the file type to store

    Press Store/Recall →Type→ State, and choose state as the storage type.

2. Choose the location of the file.

    There are ten positions in the Local C:, choose any one of them by rotating the knob.

3. Name the file and save it

    Press Save button, enter the desired name. Press Save to finish.

To Use USB Storage

As is shown in Figure 2-51, the storage location is divided into: The internal storage Local(C:) and the U Disk storage USB Device (A:). At the left side of the front panel, there is a USB interface. When USB storage is connected, the storage menu will show 'USB Device (A:)'. Otherwise, the default location is the internal location Local(C:).
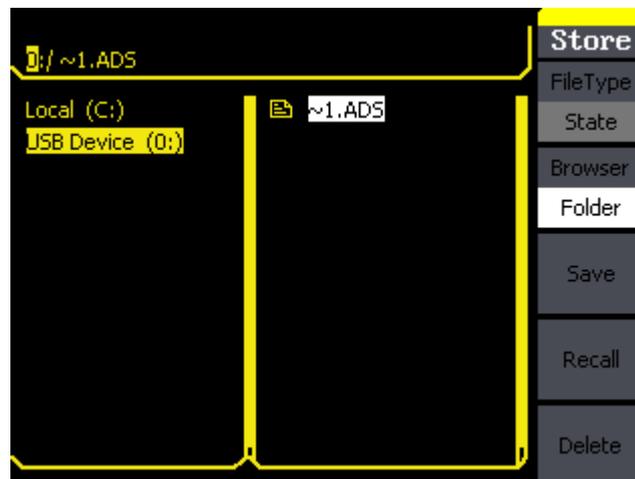
Figure 2-51 USB Storage Interface

1. Install the USB Device

   Insert the USB Device into the USB interface on the front panel, and the screen will show 'USB flash device plug in', and storage menu will show 'USB Device (A :)'

2. Choose the USB Device

   Press Browser->Directory, move the cursor with the up or down direction key to select 'USB Device (A:)'. Press the right key to open the lower directory, use the up and down direction key to choose the file 'T3AFG5-10'. Use the right key to open the lower directory, and up and down key to select the file 'Workspace'. Input the file name and save.

3. Remove the USB Device

Remove the USB Device from the interface. The system will inform you 'USB flash device plug out', and the 'USB Device (A:)' in the storage menu will disappear.

Note: USB Device can only be use U Disk; portable hard disk is not supported.

To Save a File

Press Store/Recall →Store, to enter the following interface. Enter the desired file name in the 'File Name' frame. In the middle of the figure below is the input keypad, used to edit the file name. Use the up and down direction keys and knob to select the desired character; use the left and right direction keys to edit the input file name.
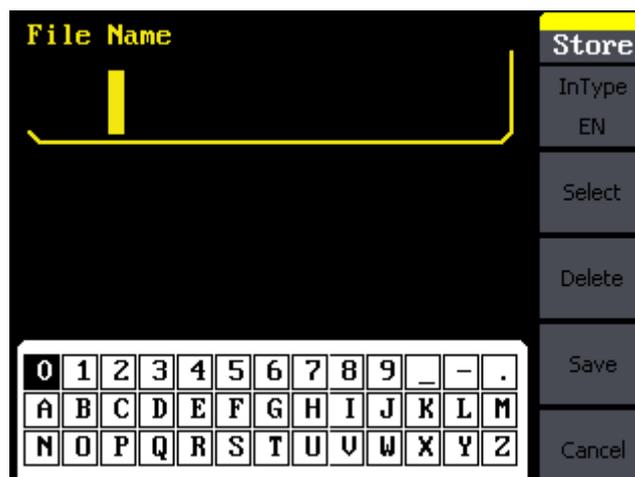
Figure 2-52 File Storage Interface

Figure 2-53

Table 2-27 Menu Explanation of File Storage
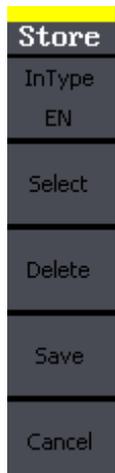
Function Menu	Settings	Explanation
Input Type	En	English input.
Select		Select the current character.
Delete		Delete the current character.
Save		Store the file with the current name

1. English Input

The English input interface is as shown in Figure 2-54, to save a file named 'NEWFILE', follow the steps below:
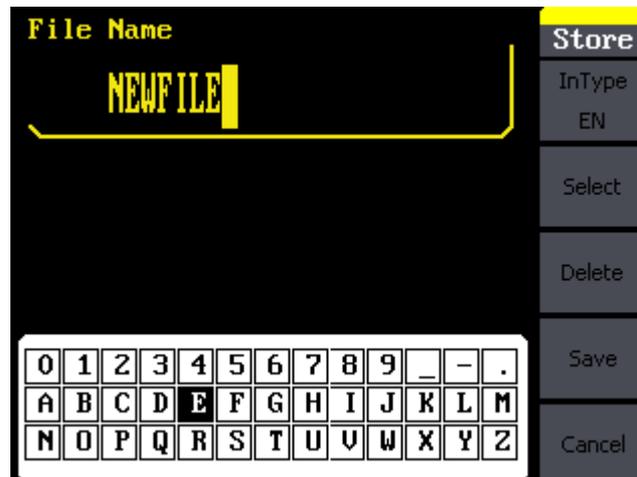
Figure 2-54 English Input Interface

(1) Press InType->En, to enter the English interface.

(2) Input the file name' NEWFILE'.

Use the Knob to adjust the cursor's horizontal position and the up and

down key to adjust the vertical position. Select the Character 'N' and press Select. Repeat this until you have inputted 'NEWFILE'.

(3) Edit the File Name

When you have entered a wrong character, move the cursor to the wrong character to be deleted and press Delete to remove it. Re-enter the file name.

(4) Press Save, to finish and save the file.

2.11. To Set the Utility Function

With the Utility Function, you can set the parameters of the generator such as: DC On/Off, Sync On/Off, Output Parameter, Interface Parameter, System Setting and Testing Parameter. The DC On/Off offers the options of DC output or Arbitrary Waveform Output. Sync On/Off offers the option to choose the Sync Signal or not. Output Setting provides the parameter setting for Load/HighZ and Normal/Inverse. The System Setting provides the setting for Language, Display, Beep, Screen Guard, Format, Power System Configure and default setting; Test provides the self-testing and calibration function.

Press Utility button, to enter the Utility Menu. Its functions are listed below in Figure 2-55

Figure 2-55   Table 2-28 Menu Explanations of Utility System Setting (Page1/2)

Function Menu	Settings	Explanation
DC	On Off	Set the output waveform to be DC. Set the output waveform to be arbitrary.
Output Setup		Set the output parameter.
Sync		Set the sync output

Figure 2-56   Table 2-29 Menu Explanations of Utility System Setting (Page2/2)
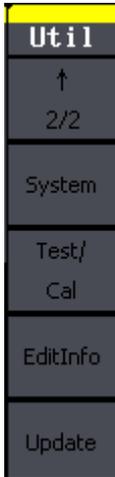
Function Menu	Settings	Explanation
System		Set the system configuration.
Test/Cal		Test and calibrate the instrument.
EditInfo		Information of the system.
Update		Update function.

To Set the DC Output

Press ⌈Utility⌋→DC→DC On, to enter the following interface. Please note that there is a 'DC On' sign at the middle left of the screen.
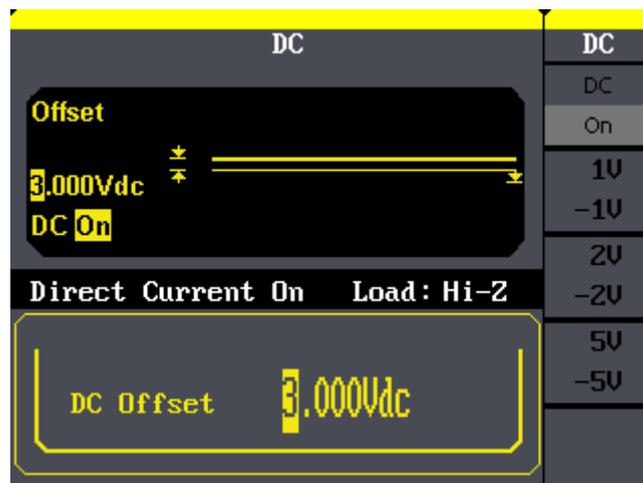

Figure 2- 57 DC Setting Interface

DC Offset

Set the DC voltage level.

To Shift into the Arbitrary Waveform Output

1. Press Utility→DC→DC Off, to close DC output and return to arbitrary waveform output.

2. Press any functional button, and the waveform output setting turns into the arbitrary waveform output. The DC output is turned off automatically.

To Set IO

Press Utility →IO Setup, to set the IO interface. The equipment supports RAW protocol and TMC protocol, user may setup corresponding protocol by IO Setup.

To Set Output Parameter

Press Utility→Output Setup, to enter the following interface.
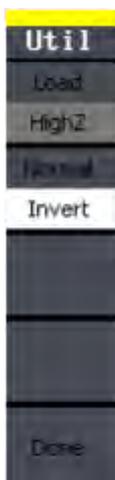
Figure 2-58   Table 2-30 Menu Explanations of Output Setting (Page 1/2)

Function Menu	Settings	Explanation
Load HighZ		Set the load connected to the Output Connector; Set the load connected to the Output Connector to be HighZ.
Normal Invert		Normal output; Inverse output.

1. To Set the Output Load

For the [Output] connector on the front panel, the generator has a built-in 50Ω series impendence. If the actual load does not match the set one, the displayed amplitude and offset will be incorrect. This function is used to match the displayed voltage with the expected one.

Steps for setting the load: Press Utility →Output Setup→ Load, to enter the following interface. Please note that the load parameter shown on the right bottom is the default setting when the power is on or the pre-set load value. If the current value is valid for the output, then current value will be used.

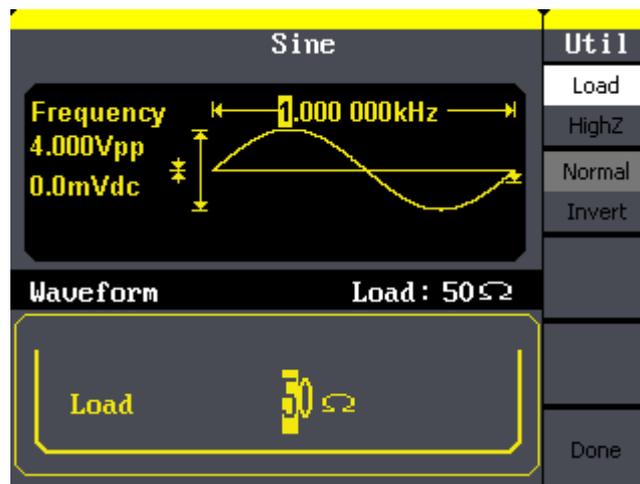Figure 2-59 Set the Output Load

Instruction

T3AFG5-10 Series has a fixed 50Ω Series Impendence. No matter what value the set parameter is, if the real load is different from the set one, the displayed voltage will not equal the real voltage.

2. To Set the Invert Waveform

Press Utility →Output Setup→ Invert, to set the Inverse Waveform Output. When the waveform is in inverse mode, offset is disabled.

3. To Set the Sync Output

The generator provides Sync output through the [Sync] connector on the rear panel. All standard output functions (except DC and Noise) have a corresponding Sync signal. For some applications, they can be disabled if users do not want to use it,

- **In the default setting, the Sync signal should be connected to the [Sync] connector (activated). When the Sync Signal is disabled, the output voltage of the [Sync] connector is level low.**
- **In the Inverse Mode, the Waveform that corresponds to the Sync Signal does not invert.**
- **The Sync Signal is a Pulse Signal with fixed positive pulse width, which is more than 50ns.**
- **For non-modulated waveform, the Sync Signal reference is the carrier.**
- **For internal modulating AM, FM and PM, the Sync signal reference is the modulated signal (not the carrier signal).**
- **For ASK and FSK, the Sync Signal Reference is the keying Frequency.**
- **For a Sweep, when the sweep starts, the Sync Signal becomes TTL Level High. The Sync frequency equals the specific Sweep time.**

- **For the Burst, when the burst starts, the Sync Signal is Level High.**
- **For the External Gated Burst, the Sync Signal follows the External Gated Signal.**

To Set the System

Press Utility → System, to enter the following interface.

Figure 2-59   Table 2-31 Menu Explanations of System Setup (Page 1/2)

Function Menu	Settings	Explanation
Number format		Set the number format.
Language		Set the display language.
Power On	Default Last	All the settings return to default when powered; All the settings return to the last one when powered.
Set to Default		Set all the settings to default.

Figure 2-60   Table 2-32 Menu Explanations of System Setup (Page 2/2)

Function Menu	Settings	Explanation
Beep	On Off	Open beep; Close beep.
ScrnSvr	1min 5min 15min 30min 1hour 2hour 5hour	Activate the screen saver program. Screen saver will be on if no action is taken within the time that you have selected. Press any button the resume.
	Off	Deactivate the screen saver program.

Key points:

Power On

Choose the configuration setting when the machine is powered on.

Two choices are available: the default setting and the latest. Once selected, the setting will be used when the instrument is first powered on.

Beep

Activate or deactivate the sound when an error occurs from the front panel or the remote interface. Activate or deactivate any sound made by the button or knob on the front panel. The current setting is stored in the non-volatile memory.

1. **Set the Format**

Press Utility →System→ Number Format, to enter the following interface.
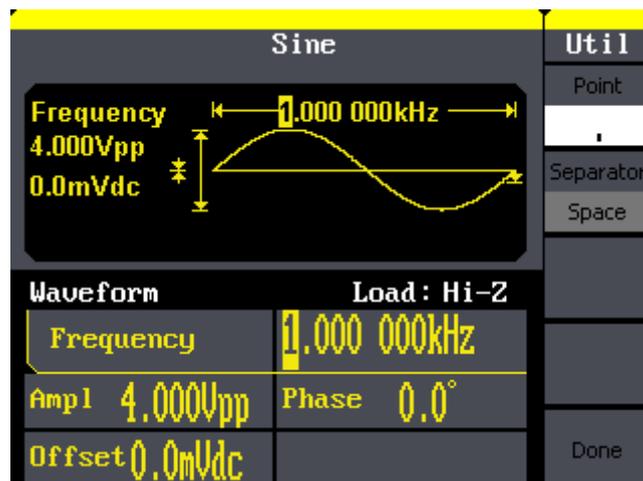

Figure 2-61 Set the number Format

Figure 2-62

Table 2-33 Menu Explanations of Setting the Number Format

Function Menu	Settings	Explanation
Point	•	Using dot to represent point;
	,	Using comma to represent point.
Separator	On	Enable the Separator;
	Off	Close the Separator;
	Space	Use Space to separate.

According to the different choices of the point and the separator, the format can have various forms.

(1) • as point, press Separator->On, the example is as followed:

Figure 2- 63 Set Format

(2) , as point, press ->Separator->On, the example is as followed:

Figure 2- 64 Set Format

(3) • as point, press Separator->Off, the example is as followed:

Figure 2-65 Set Format

(4) ⚑ as point, press Separator->Off, the example is as followed:

Frequency   1,000000kHz

Figure 2-66 Set Format

(5) • as point, press Separator->Space, the example is as followed:

Frequency   1.000 000kHz

Figure 2-67 Set Format

(6) ⚑ as point, press Separator->Space, the example is as followed:
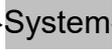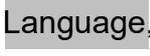
Frequency   1,000 000kHz

Figure 2-68 Set Format

2. Language Setup

The T3AFG5-10 Series Generator offers two languages (English and Simplified Chinese) for user to choose.

To Select Language, press Utility and then Language to select the language.

The Procedure is as followed:

Press Utility →System→ Language, to change the language.

3. To Return to Default Setting

Press $\boxed{\text{Utility}}$ → System→ Set to Default, to set the system to the default setting. The default settings of the system are as followed:

Table 2- 34 Factory Default Setting

Output	Default
Function	Sine Wave
Frequency	1kHz
Amplitude/Offset	4Vpp/0Vdc
Phase	0°
Terminals	High Z
Modulation	**Default**
Carrier	1kHz Sine Wave
Modulating	100Hz Sine Wave
AM Depth	100
FM Deviation	500Hz
Key Freq	100Hz
Key Freq	100Hz
FSK Hop Frequency	1MHz
Phase Deviation	180°
Sweep	**Default**
Start/Stop Frequency	100Hz/1.9kHz
Sweep Time	1S Trig
Out	Off
Mode	Linear
Direction	↑
Burst	**Default**
Period	10ms
Phase	0°
Count	1Cycle
Trig	Off
Trigger	**Default**
Source	Internal

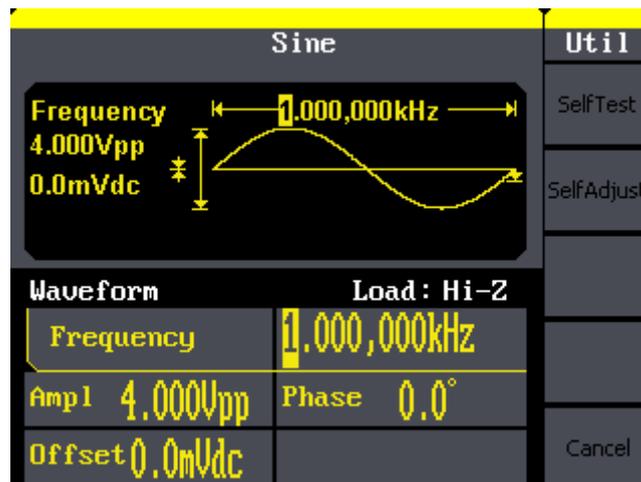## 2.12. Test/Cal

Press Utility →Test/Cal, to enter the following menu.

Figure 2-69 Test/Cal function Menu

Figure 2-70

Table 2-35 Menu Explanations of Test Setting

Function Menu	Settings	Explain
SelfTest		Perform system self-test.
SelfCal		Do self calibration

SelfTest

Press Utility →Test/Cal →SelfTest, to enter the following menu.

Figure 2-71   Table 2-36 Menu Explanations of Self Test

Function Menu	Settings	Explain
Scr Test		Run screen test program.
Key Test		Run keyboard test program.
LED Test		Run LED test program.

1. Scr Test

Select Scr Test to enter the screen test interface. The words 'Press '7' Key to continue, Press '8' Key to exit' is displayed. You could press the '7' for test.
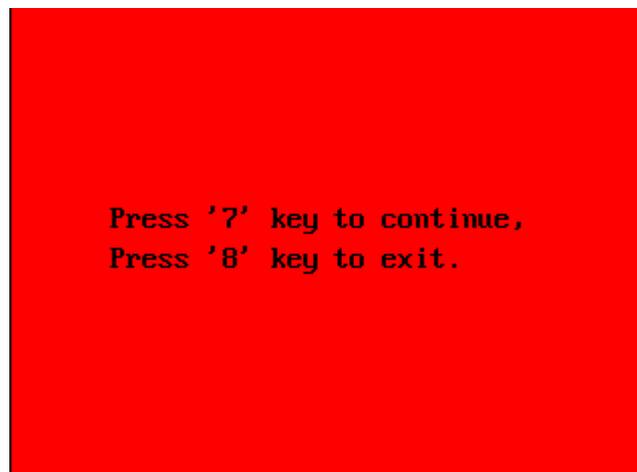

Figure 2- 72 Screen Test Interface

2. Key Test

Select 'keyboard Test' to enter the keyboard test interface, the on-screen rectangle shapes represent the front panel keys. The shapes with two arrows beside them represent the front panel knobs. Test all keys and knobs and you should also verify that all the backlit buttons illuminate correctly.

Note:

- **When you operate, the screen would display the white (color LCD).**
- **The tested button or knobs corresponding area would display green (color LCD).**
- **At the bottom of the screen display 'Press '8' Key Three Times to exit' information is displayed to indicate that pressing '8' three times Is required to exit the test.**
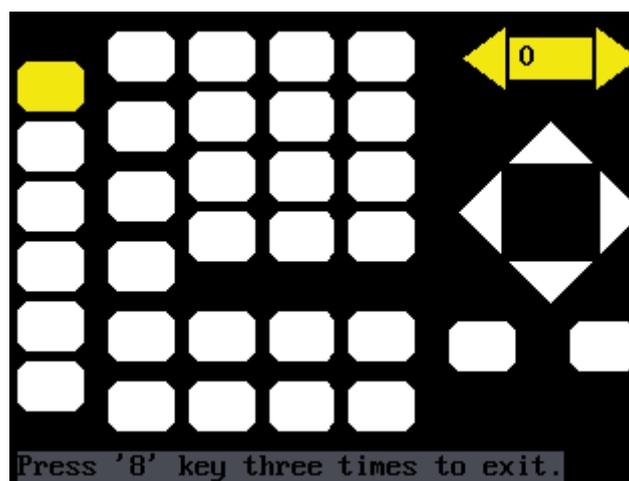
Figure 2-73 Key Test Interface

3. LED Test

Select 'LED Test' to enter the below interface. The on-screen rectangle shapes represent the front panel keys; the shapes with two arrows beside them represent the front panel knobs. The instructions 'Press '7' Key to continue, 'Press '8' Key to exit' is displayed, You could press the '7' button continuously for testing, when buttons are lit the corresponding area on the screen would display green (color LCD).

Figure 2-74 Led Test Interface

SelfCal

Press $\boxed{\text{Utility}}$ →1/2→Test/Cal →SelfCal, to enter SelfCal, as is shown in Figure 2-5

SelfCal: If the environment where the generator is being used changes, then it is recommended to do a self calibration.
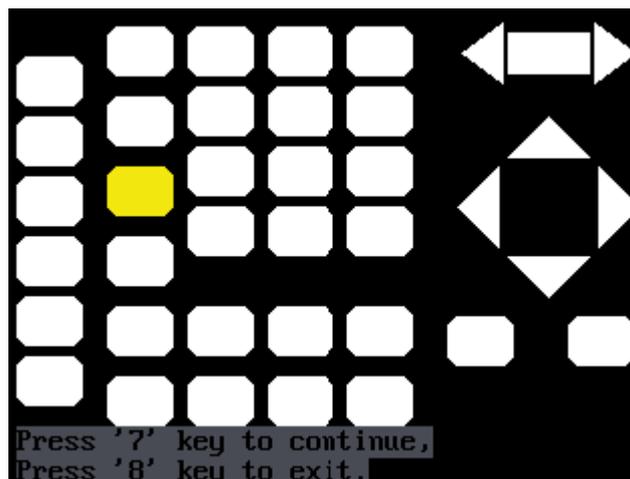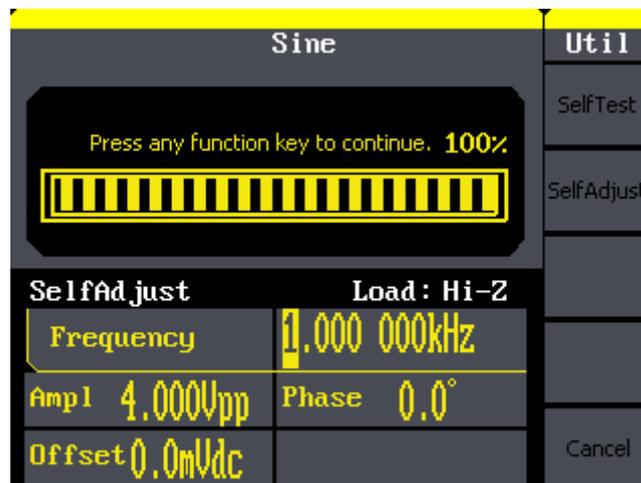
Figure 2-75 SelfCal Interface

2.13. Edition Information

Press the EditInfo option button of the Utility Menu to view the generator's hardware and software configuration.
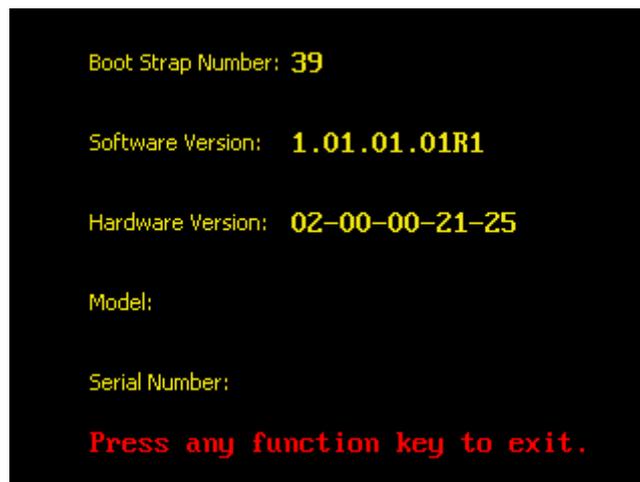
Figure 2-76 Edit Info Interface

Edition Information introduction

Boot-strap No:

The times of boot-strap

Software version:

Software version of current equipment

Hardware version:

02-00-00-21-25 represents ordinally: PCB version, BOM version, Daughter card version, FPGA version, CPLD version.

Model:

Contains information of brand of product, series, bandwidth.

For example: T3AFG5 represents Teledyne Test Tools T3AFG5-10 series function/arbitrary waveform generator with 5MHz bandwidth.

Serial No:

The serial number information includes a date code.

2.14. Updating Firmware

Using USB flash drive to update firmware

The software of the generator can be updated directly via USB flash drive. This process takes about two minutes. Follow the next steps:

1. Insert USB flash drive with firmware procedure to USB host interface on the front panel of the generator.

2. Press the $\boxed{\text{Utility}}$ button to enter the 'Utility Menu'.

3. Press '1/3' option button to enter the third page of 'Utility Menu'.

4. Press the 'Update' option button.

5. Press 'Browser' option button to select 'Directory', then select the 'USB Device (A:)' through direction key.

6. Press 'Browser' option button to select 'File', then select the 'XXXX.ADS' file using the direction keys.

7. Press the 'Recall' option button to update.

8. After finishing the update, restart the generator.

Note: Don't disconnect the power whilst the generator is being updated.

2.15. How to Use the Built-in Help System

You can get help for every button on the front panel by using the built-in help system. Or you can get help about the operation of the front panel buttons with the help list.

Press Help to enter the following interface.

1	View the instrument information
2	Basic waveform output
3	Arbitrary waveform output
4	Generate a DC signal
5	Generate a modulated waveform
6	Sweep output
7	Burst output
8	Storage management
9	Synchronize multiple instruments
10	Reset the instrument to default state
11	Technical support
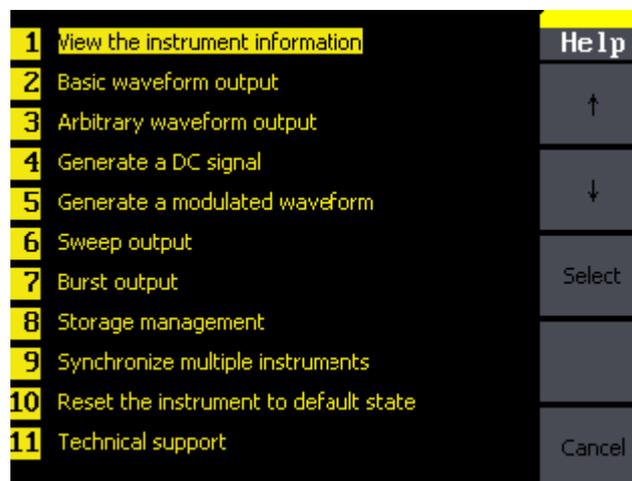
Figure 2-77 Help Menu

Figure 2-78

Table 2-37 Help Menu Explanations

Function Menu	Settings	Explanation
↑		Cursor upward to select.
↓		Cursor downward to select.
Choice		Select to read the information.

3. Application and Examples

To help the user master how to use the Function/ Arbitrary Waveform Generator more efficiently, we will describe some examples in detail. All the examples below use the default setting of the instrument with some Explanation on setup.

This chapter includes the following topics:

- **Example 1: Generate a Sine Wave**
- **Example 2: Generate a Square Wave**
- **Example 3: Generate a Ramp Wave**
- **Example 4: Generate a Pulse Wave**
- **Example 5: Generate a Noise Wave**
- **Example 6: Generate an Arbitrary Wave**
- **Example 7: Generate a Sweep Wave**
- **Example 8: Generate a Burst Wave**
- **Example 9: Generate an AM Wave**
- **Example 10:Generate a FM Wave**
- **Example 11:Generate a PM Wave**
- **Example 12:Generate a FSK Wave**
- **Example 13:Generate an ASK Wave**
- **Example 14:Generate a PWM Wave**
- **Example 15:Generate a DSB-AM Wave**

3.1. Example 1:Generate a Sine Wave

Generate a sine wave with 50kHz frequency, 5Vpp amplitude and 1Vdc offset.

➢ **Steps:**

● **Set the frequency.**

1. Press Sine →Freq and choose frequency which will display in white color.
2. Input '50' from the keyboard and choose the unit 'kHz'. The frequency is set to be 50kHz.

● **Set the amplitude.**

1. Press Ampl to choose Ampl which will display in white color.
2. Input '5' from the keyboard and choose the unit 'Vpp'. The amplitude is set to be 5Vpp.

● **Set the Offset.**

1. Press Offset to choose Offset which will display in white color
2. Input '1' from the keyboard and choose the unit 'Vdc'. The offset is set to be 1Vdc.

When the frequency, amplitude and offset are set, the wave generated is shown in Figure 3- 1;
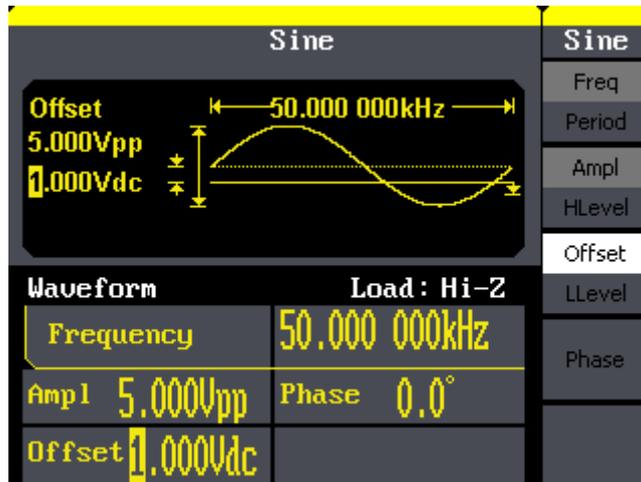

Figure 3-1 Sine Waveform

3.2. Example 2:Generate a Square Wave

Generate a square wave with 5kHz frequency, 2Vpp amplitude, 0Vdc offset and 30% duty cycle.

➢ **Steps:**

● **Set the frequency.**

1. Press Square →Freq and choose Frequency which will display in white color.

2. Input '5' from the keyboard and choose the unit 'kHz'. The frequency is set to be 5kHz.

● **Set the amplitude.**

1. Press Ampl to choose Ampl which will display in white color.

2. Input '2' from the keyboard and choose the unit 'Vpp'. The amplitude is set to be 2Vpp.

● **Set the offset.**

1. Press Offset to choose Offset which will display in white color

2. Input '0' from the keyboard and choose the unit 'Vdc'. The Offset is set to be 0Vdc.

● **Set the duty**

1. Press Duty to choose Duty which will display in white color

2. Input '30' from the keyboard and choose the unit '%'. The duty is set to be 30%.

When the frequency, amplitude, offset and duty cycle are set, the wave generated is shown in Figure 3-2.
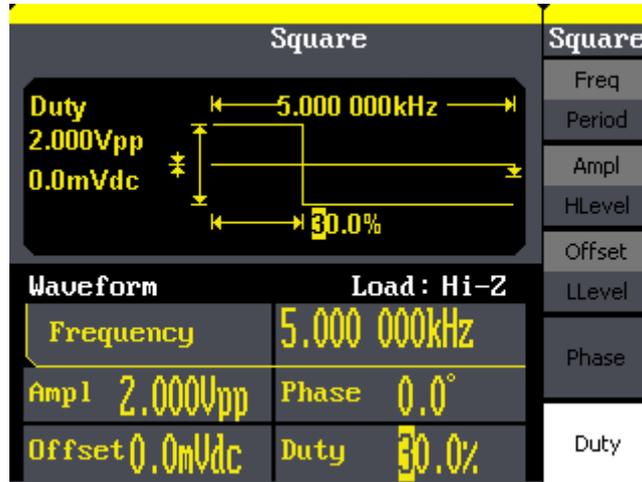

Figure 3- 2 Square Waveform

3.3. Example 3:Generate a Ramp Wave

Generate a ramp wave with 10μs period, 100mVpp amplitude, 20mVdc offset, 45°phase and 30% symmetry.

➢ **Steps:**

● **Set the period.**

1. Press Ramp →Freq and choose Period which will display in white color.

2. Input '10' from the keyboard and choose the unit 'μs'. The period is set to be 10μs.

● **Set the amplitude.**

1. Press Ampl to choose Ampl which will display in white color.

2. Input '100' from the keyboard and choose the unit 'mVpp'. The amplitude is set to be 100mVpp.

● **Set the offset.**

1. Press Offset to choose Offset which will display in white color

2. Input '20' from the keyboard and choose the unit 'mVdc'. The offset is set to be 20mVdc.

● **Set the phase**

1. Press Phase to choose Phase which will display in white color

2. Input '45' from the keyboard and choose the unit ' °'. The phase is set to be 45°.

- **Set the symmetry**
1. Press Symmetry to choose Symmetry which will display in white color.
2. Input '30' from the keyboard and choose the unit '30%'. The symmetry is set to be 30%.

When the period, amplitude, offset, phase and symmetry are set, the wave generated is shown in Figure 3-3:
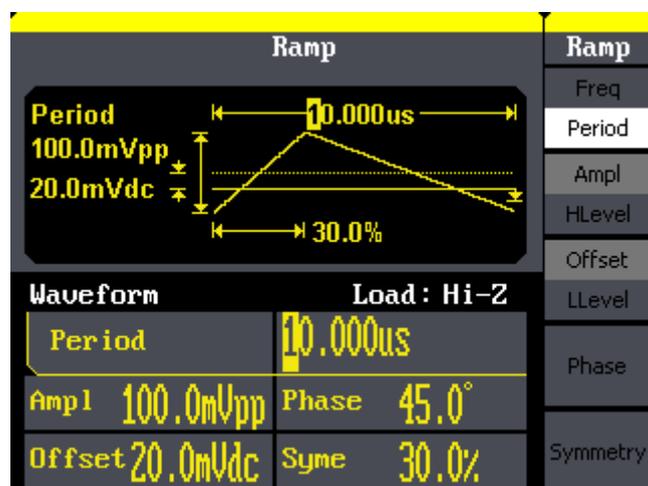

Figure 3-3 Ramp Waveform

3.4. Example 4:Generate a Pulse Wave

Generate a pulse wave with 5kHz frequency, 5V high level, -1V low level, 40μs pulse width and 20ns delay.

➤ **Steps:**

● **Set the frequency.**

1. Press Pulse → Freq and choose Freq, which will display in white color.

2. Input '5' from the keyboard and choose the unit 'kHz'. The frequency is set to be 5 kHz.

● **Set the high level**

1. Press Ampl and choose the HLevel which will display in white color.

2. Input '5' from the keyboard and choose the unit 'V'. The high level is set to be 5V.

● **Set the low level**

1. Press Offset and choose the LLevel which will display in white color.

2. Input '-1' from the keyboard and choose the unit 'V'. The low level is set to be -1V.

● **Set the pulse width**

1. Press PulWidth and choose PulWidth which will display in white color.

2. Input '40' from the keyboard and choose the unit 'μs'. The pulse width is set to be 40μs.

● **Set the Rising Edge**

1. Press Rising Edge and choose Rising Edge which will display in white.

2. Input '20' from the keyboard and choose the unit 'ns'. The delay is set to be 20ns.

When the frequency, high level, low level, pulse width and delay are set, the wave generated is shown in Figure 3-4
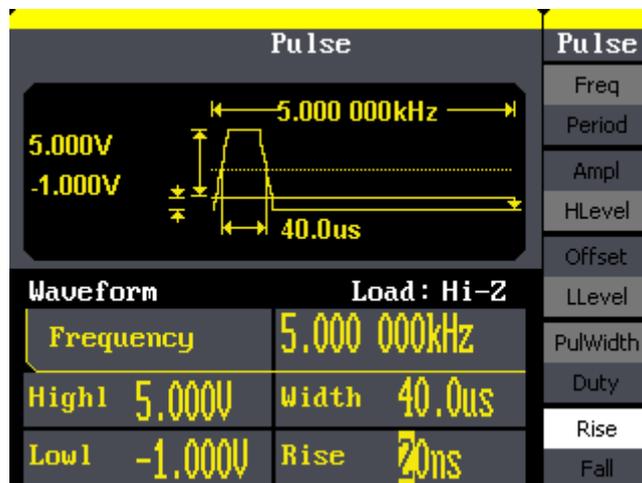

Figure 3-4 Pulse Waveform

3.5. Example 5:Generate a Noise Wave

Generate a noise waveform with 2V stdev and 1 V mean.

➢ **Steps:**

● **Set the stdev**

1. Press Noise →Stdev.

2. Input '10' from the keyboard and choose the unit 'mV'. The amplitude is set to be 10 mV.

● **Set the mean**

1. Press Mean.

2. Input '5' from the keyboard and choose the unit 'mV'. The offset is set to be 5 mV.

When the amplitude and offset are set, the wave generated is shown in Figure 3- 5
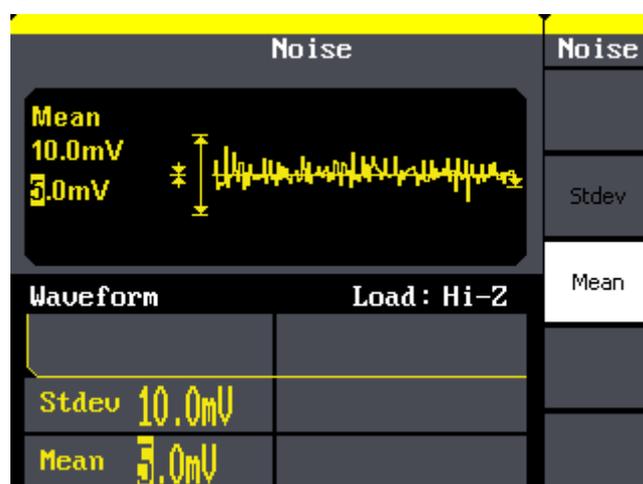

Figure 3- 5 Noise Waveform

3.6. Example 6: Generate an Arbitrary Wave

Generate an arbitrary waveform (Sinc) with 5MHz frequency, 2Vrms amplitude and 0Vdc offset.

➢ **Steps:**

● **Set the type of the arbitrary waveform.**

1. Press Arb → (1/2↓) →Load form, to choose the built-in waveform.

2. Press Built-In→ Math, There are sixteen math arbitrary waveforms.

3. Choose Sinc, and press Select to enter Arb Main Menu.

● **Set the frequency.**

1. Press Freq and choose Frequency which will display in white.

2. Input '5' from the keyboard and choose the unit 'MHz'. The frequency is set to be 5MHz.

● **Set the amplitude**

1. Press Ampl to choose Ampl which will display in white.

2. Input '2' from the keyboard and choose the unit 'Vrms'. The amplitude is set to be 2Vrms.

● **Set the offset**

1. Press Offset to choose Offset which will display in white.

2. Input '0' from the keyboard and choose the unit 'Vdc'. The offset is set to be 0Vdc.

When the arbitrary waveform's type, frequency, amplitude and offset are set, the wave generated is shown in Figure 3-6:
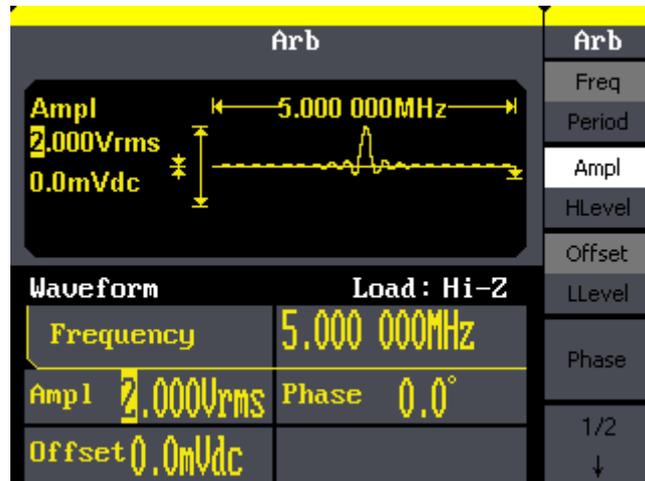

Figure 3-6 Sinc Waveform

3.7. Example 7: Generate a Swept Linear Wave

Generate a sine sweep waveform whose frequency starts from 100Hz to 10kHz. Use internal trigger mode, linear sweep, and the sweep time is 2s.

➢ **Steps:**

● **Set the sweep function:**

Press Sine and choose the sine waveform as the sweep function.

The default setting of the source is internal.

● **Set the frequency, amplitude and offset.**

1. Press Freq and choose Freq which will display in white. Input '5' from the keyboard and choose the unit 'kHz' to set the frequency 5kHz.

2. Press Ampl to choose Ampl which will display in white. Input '5' from the keyboard and choose the unit 'Vpp' to set the amplitude 5Vpp.

3. Press Offset to choose Offset which will display in white. Input '0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc

● **Set the sweep time.**

Press Sweep →Sweep Time, Input '2' from the keyboard and choose the unit 's' to set sweep time 2s.

● **Set the start frequency**

Press Start Freq, Input '100' from the keyboard and choose the unit 'Hz' to set start freq 100Hz.

- **Set the end frequency**

  Press Stop Freq, Input '10' from the keyboard and choose the unit 'kHz' to set stop freq 10kHz.

- **Set the Sweep Mode**

  Press (1/2↓) →Linear, and choose Linear.

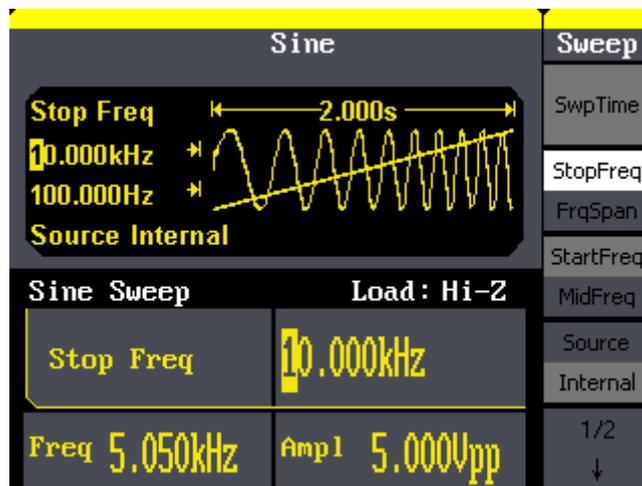When all parameters above are set, the linear sweep wave generated is shown in Figure 3-7

Figure 3-7 Sweep Waveform

3.8. Example 8:Generate a Burst Wave

Generate a burst waveform of 5 cycles. The period is 3ms. Use internal trigger and 0 degree phase.

➢ **Steps:**

● **Set the sweep function:**

Press Sine and choose the sine waveform as the burst function. The default setting of the source is internal.

● **Set the frequency, amplitude and offset**

1. Press Freq and choose Freq which will display in white. Input '10' from the keyboard and choose the unit 'kHz' to set the frequency 10kHz.

2. Press Ampl to choose Ampl which will display in white. Input '1' from the keyboard and choose the unit 'Vpp' to set the amplitude 1Vpp.

3. Press Offset to choose Offset which will display in white. Input '0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc

● **Set the sweep mode.**

Press Burst→N Cycle, choose N Cycle Mode.

● **Set the burst period**

Press Period, input '3' from the keyboard and choose the unit 'ms' to set the period 3ms.

● **Set the start phase**

Press Start Phase, input '0' from the keyboard and choose the unit ' °' to

set the start phase 0°.

- **Set the burst cycles**

  Press (1/2↓) →Choose Cycles, Input '5' from the keyboard and choose the unit 'Cycle' to set the burst cycle 5.

- **Set the delay**

  Press Delay, and input '100' from the keyboard and choose the unit 'µs' to set the delay 100µs.

When all parameters above are set, the wave generated is shown in Figure 3-8:
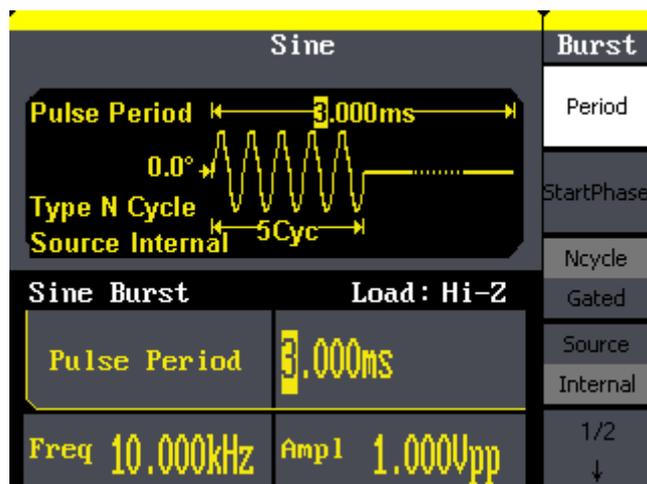

Figure 3-8 Burst Waveform Output

3.9. Example 9:Generate an AM Wave

Generate an AM waveform with 80% depth. The carrier is a sine wave with 10kHz frequency, and the modulating wave is a sine wave with 200Hz frequency.

➢ **Steps:**

● **Set the frequency, amplitude and offset of the carrier wave.**

1. Press⌊Sine⌋, and choose the sine waveform as the carrier wave

2. Press Freq and choose Freq which will display in white. Input'10' from the keyboard and choose the unit 'kHz' to set the frequency 10kHz

3. Press Ampl and choose Ampl which will display in white. Input'1' from the keyboard and choose the unit 'Vpp' to set the amplitude 1Vpp.

4. Press Offset and choose Offset which will display in white color. Input'0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc.

● **Set the modulation type AM and parameters.**

1. Press⌊Mod⌋→Type → AM, choose AM. Please notice that the message shown on the middle left side of the screen is 'AM'.

2. Press AM Freq, input '200' from the keyboard and choose the unit 'Hz' to set the AM freq 200Hz.

3. Press AM Depth, input '80' from the keyboard and choose the unit '%' to set the AM depth 80%.

4. Press Shape →Sine, to choose sine wave as the modulating waveform.

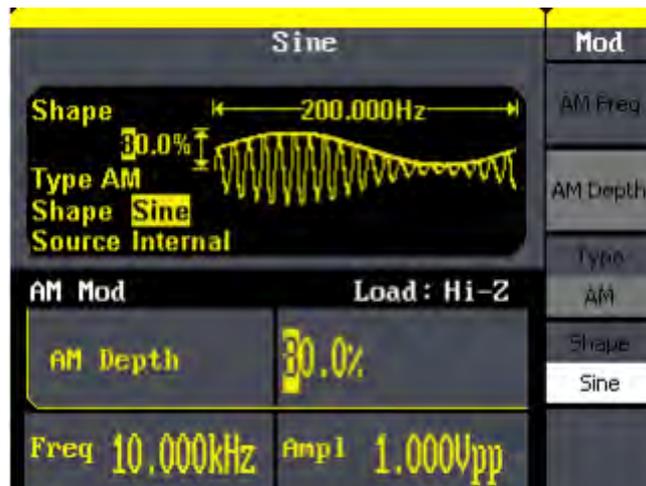When all parameters above are set, the wave generated is shown in Figure 3-9:

Figure 3-9 AM Waveform

3.10. Example 10: Generate a FM Wave

Generate a FM waveform, the carrier is a sine wave with 10kHz frequency, and the modulating wave is a sine wave with 1 Hz frequency, 2kHz frequency deviation.

➢ **Steps:**

● **Set the frequency, amplitude and offset of the carrier wave.**

1. Press Sine and choose the sine waveform as the carrier wave

2. Press Freq and choose Freq which will display in white. Input '10' from the keyboard and choose the unit 'kHz' to set the frequency 10kHz

3. Press Ampl and choose Ampl which will display in white. Input '1' from the keyboard and choose the unit 'Vpp' to set the amplitude 1Vpp.

4. Press Offset and choose Offset which will display in white. Input '0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc.

● **Set the modulation type FM and parameters.**

1. Press Mod →Type → FM, choose FM. Please notice that the message shown on the middle left side of the screen is 'FM'.

2. Press FM Freq, input '1' from the keyboard and choose the unit 'Hz' to set the AM Freq 1Hz.

3. Press FM Dev, input '2' from the keyboard and choose the unit 'kHz' to set the FM deviation 2kHz.

4. Press Shape →Sine, to choose sine wave as the modulating waveform.

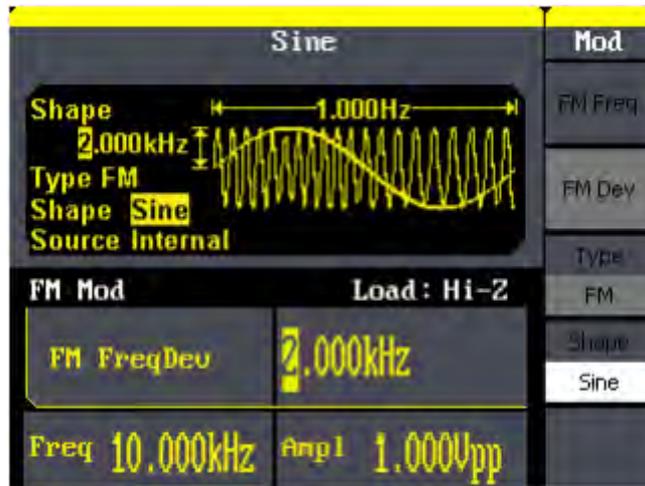When all parameters above are set, the wave generated is shown in Figure

3-10:

Figure 3-10 FM Waveform

3.11. Example 11: Generate a PM Wave

Generate a PM waveform, the carrier is a sine wave with 10kHz frequency, and the modulating wave is a sine wave with 2kHz frequency, 90°phase deviation.

➢ **Steps:**

● **Set the frequency, amplitude and offset of the carrier wave.**

1. Press Sine , and choose the sine waveform as the carrier wave

2. Press Freq and choose Freq which will display in white. Input '10' from the keyboard and choose the unit 'kHz' to set the frequency 10kHz

3. Press Ampl and choose Ampl which will display in white. Input '5' from the keyboard and choose the unit 'Vpp' to set the amplitude 5Vpp.

4. Press Offset and choose Offset which will display in white. Input '0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc.

● **Set the modulation type PM and parameters.**

1. Press Mod →Type → PM, choose PM. Please notice that the message shown on the middle left side of the screen is 'PM'.

2. Press PM Freq, input '2' from the keyboard and choose the unit 'kHz' to set the PM freq 2kHz.

3. Press Phase Dev, input '90' from the keyboard and choose the unit ' °' to set the phase deviation 90°.

4. Press Shape →Sine, to choose sine wave as the modulating waveform.

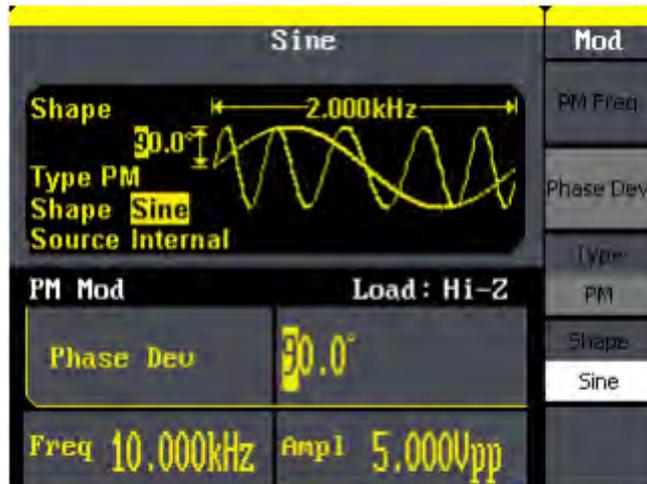When all parameters above are set, the wave generated is shown in Figure 3-11:

Figure 3-11 PM Waveform

3.12. Example 12: Generate a FSK Wave

Generate a FSK waveform with 200Hz key frequency. The carrier is a sine wave with 10kHz frequency, and the hop frequency is 500Hz.

➢ **Steps:**

● **Set the frequency, amplitude and offset of the carrier wave.**

1. Press Sine , and choose the sine waveform as the carrier wave

2. Press Freq and choose Freq which will display in white. Input '10' from the keyboard and choose the unit 'kHz' to set the frequency 10kHz

3. Press Ampl and choose Ampl which will display in white. Input '5' from the keyboard and choose the unit 'Vpp' to set the amplitude 5Vpp.

4. Press Offset and choose Offset which will display in white. Input '0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc.

● **Set the modulation type FSK and parameters.**

1. Press Mod →Type → FSK, choose FSK. Please notice that the message shown on the middle left side of the screen is 'FSK '.

2. Press Key Freq, input '200' from the keyboard and choose the unit 'Hz' to set the key frequency 200 Hz.

3. Press Hop Freq, input '500' from the keyboard and choose the unit 'Hz' to set the hop frequency 500Hz.

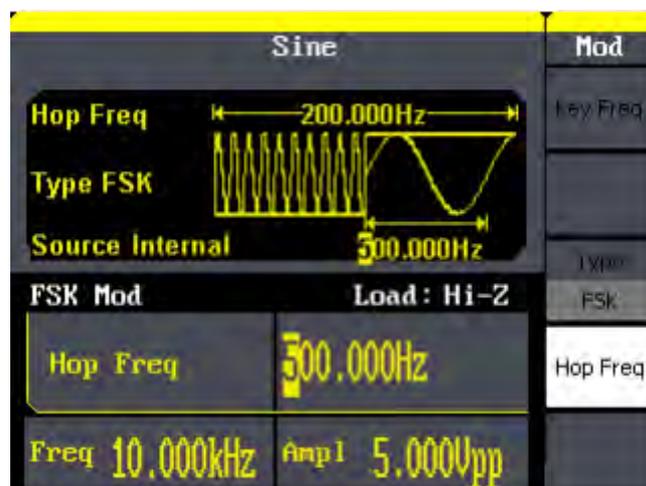When all parameters above are set, the wave generated is shown in Figure 3-12:

Figure 3-12 FSK Waveform

3.13. Example 13: Generate an ASK Wave

Generate an ASK waveform with 500Hz key frequency. The carrier is a sine wave with 5kHz frequency.

➢ **Steps:**

● **Set the frequency, amplitude and offset of the carrier wave.**

1. Press Sine , and choose the sine waveform as the carrier wave

2. Press Freq and choose Freq which will display in white. Input '5' from the keyboard and choose the unit 'kHz' to set the frequency 5kHz

3. Press Ampl and choose Ampl which will display in white. Input '5' from the keyboard and choose the unit 'Vpp' to set the amplitude 5Vpp.

4. Press Offset and choose Offset which will display in white color. Input '0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc.

● **Set the modulation type ASK and parameters.**

1. Press Mod →Type → ASK, choose ASK. Please notice that the message shown on the middle left side of the screen is 'ASK '.

2. Press Key Freq, input '500' from the keyboard and choose the unit 'Hz' to set the key freq 500 Hz.

When all parameters above are set, the wave generated is shown in Figure
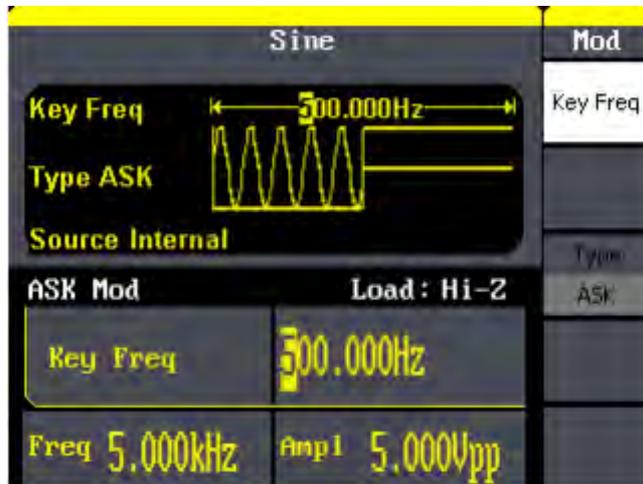3-13

Figure 3- 13 ASK Waveform

3.14. Example 14: Generate a PWM Wave

Generate a PWM waveform with 200Hz key frequency. The carrier is a pulse wave with 5kHz frequency.

➢ **Steps:**

● **Set the frequency, amplitude and offset of the carrier wave.**

1. Press Pulse , and choose the Pulse waveform as the carrier wave

2. Press Freq and choose Freq which will display in white color. Input '5' from the keyboard and choose the unit 'kHz' to set the frequency 5kHz

3. Press Ampl and choose Ampl which will display in white. Input '5' from the keyboard and choose the unit 'Vpp' to set the amplitude 5Vpp.

4. Press Offset and choose Offset which will display in white. Input '0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc.

5. Press PulWidth and choose PulWidth which will display in white. Input '40' from the keyboard and choose the unit 'us' to set the PulWidth 40us

● **Set the modulation type PWM and parameters.**

1. Press Mod →Type →PWM, Please notice that the message shown on the middle left side of the screen is 'PWM '.

2. Press PWN Freq, input '200' from the keyboard and choose the unit 'Hz' to set the key freq 200 Hz.

3. Press Width Dev, input '20' from the keyboard and choose the unit 'us' to set the Width Dev 20us

When all parameters above are set, the wave generated is shown in Figure
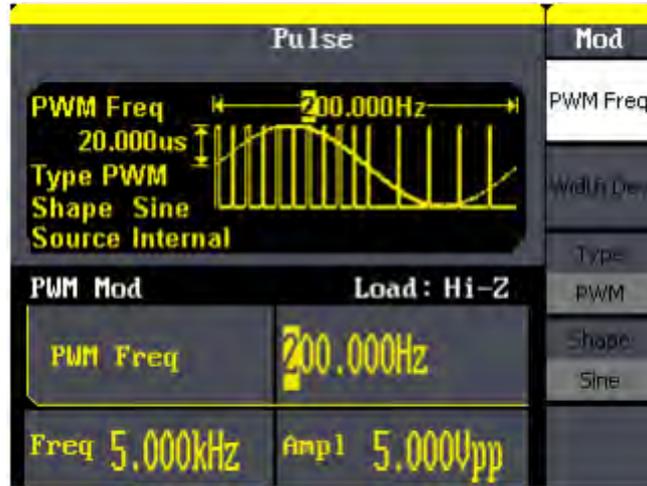
3-14

Figure 3-14 PWM Waveform

3.15. Example 15: Generate a DSB-AM Wave

Generate a DSB-AM waveform with 100Hz key frequency. The carrier is a sine wave with 2kHz frequency.

➢ **Steps:**

● **Set the frequency, amplitude and offset of the carrier wave.**

1. Press Sine , and choose the sine waveform as the carrier wave

2. Press Freq and choose Freq which will display in white. Input '2' from the keyboard and choose the unit 'kHz' to set the frequency 2kHz

3. Press Ampl and choose Ampl which will display in white. Input '4' from the keyboard and choose the unit 'Vpp' to set the amplitude 4Vpp.

4. Press Offset and choose Offset which will display in white. Input '0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc.

● **Set the modulation type DSB-AM and parameters.**

1. Press Mod →Type →DSB-AM, choose DSB-AM. Please notice that the message shown on the middle left side of the screen is 'DSB-AM '.

2. Press DSB Freq, input '100' from the keyboard and choose the unit 'Hz' to set the key freq 100Hz.

When all parameters above are set, the wave generated is shown in Figure 3-15:
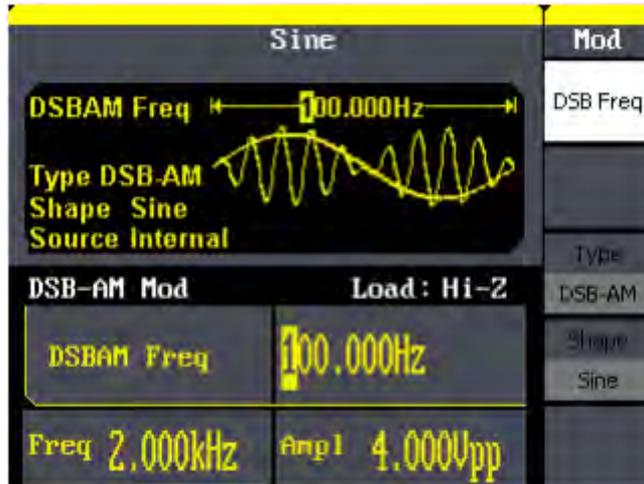

Figure 3-15 DSB-AM Waveform

4. Troubleshooting

General Inspecting

After receiving a new T3AFG5-10 Series Function/Arbitrary Waveform Generator, please inspect the instrument as follows:

1. **Inspect the shipping container for damage**.

    Keep the damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically.

2. **Inspect the whole instrument**.

    In case there is any mechanical damage or defect, or the instrument does not operate properly or fails performance tests, notify the Teledyne Test Tools sales representative. If the shipping container is damaged, or the cushioning materials show signs of stress, notify the carrier as well as the Teledyne Test Tools sales department. Keep the shipping materials for carrier's inspection.

3. **Check the accessories**.

    Accessories supplied with the instrument are listed below. If the contents are incomplete or damaged, notify the Teledyne Test Tools sales representative.

    Standard Accessories:
    - A Quick Start
    - A Certification and Guaranty Card
    - A Power Cord that fits the standard of destination country
    - A USB Cable

Troubleshooting

1. **After the waveform generator is powered on, the screen remains dark, please do the following steps:**

(1) Check the power cable's connection.

(2) Ensure the power switch is turned on.

(3) After the inspections above, restart the waveform generator.

   If the generator still doesn't work after the checking, please contact
   Teledyne Test Tools.

2. **If there is no signal wave output after setting the parameters, please do as following steps:**

(1) Check whether the BNC cable has connected with output channel or not.

(2) Check whether the output button have been turned on or not.

5. Service and Support

Maintain summary

Teledyne Test Tools warrants that the products that it manufactures and sells will be free from defects in materials and workmanship for a period of three years from the date of shipment from an authorized **Teledyne Test Tools** distributor. If a product proves defective within the respective period, **Teledyne Test Tools** will provide repair or replacement as described in the complete warranty statement.

To arrange for service or obtain a copy of the complete warranty statement, please contact your nearest **Teledyne Test Tools** sales and service office. Except as provided in this summary or the applicable warranty statement, **Teledyne Test Tools** makes no warranty of any kind, express or implied, including without limitation the implied warranties of merchantability and fitness for a particular purpose. In no event shall **Teledyne Test Tools** be liable for indirect, special or consequential damages.

6. Appendix

Appendix A: Accessories

T3AFG5-10 Series Function/ Arbitrary Waveform Generator Accessories:

Standard Accessories:
- A Quick Start
- A Calibration Certificate
- A Power Cord that fits the standard of destination country
- A USB Cable

Appendix B: Daily Maintain and Cleaning

Daily Maintain

Do not store or leave the instrument in where the LCD will be exposed to direct sunlight for long periods of time.

⚠️ **CAUTION:** To avoid damage to the instrument, do not expose them to sprays, liquids, or solvents.

Cleaning

If this instrument requires cleaning, disconnect it from all power sources and clean it with a mid detergent and water. Make sure the instrument is completely dry before reconnecting it to a power source.

To clean the exterior surface, perform the following steps:

1. Remove loose dust on the outside of the instrument with a lint-free cloth. Use care to avoid scratching the clear plastic display filter.
2. Use a soft cloth dampened with water to clean the instrument.

⚠️ **WARNING:** To avoid damage to the surface of the instrument, do not use any abrasive or chimerical cleaning agents.

TELEDYNE TEST TOOLS
Everywhere**you**look™

Company Profile

Teledyne LeCroy is a leading provider of oscilloscopes, protocol analyzers and related test and measurement solutions that enable companies across a wide range of industries to design and test electronic devices of all types. Since our founding in 1964, we have focused on creating products that improve productivity by helping engineers resolve design issues faster and more effectively. Oscilloscopes are tools used by designers and engineers to measure and analyze complex electronic signals in order to develop high-performance systems and to validate electronic designs in order to improve time to market.

The Teledyne Test Tools brand extends the Teledyne LeCroy product portfolio with a comprehensive range of test equipment solutions. This new range of products delivers a broad range of quality test solutions that enable engineers to rapidly validate product and design and reduce time-to-market. Designers, engineers and educators rely on Teledyne Test Tools solutions to meet their most challenging needs for testing, education and electronics validation.

Location and Facilities

Headquartered in Chestnut Ridge, New York, Teledyne Test Tools and Teledyne LeCroy has sales, service and development subsidiaries in the US and throughout Europe and Asia. Teledyne Test Tools and Teledyne LeCroy products are employed across a wide variety of industries, including semiconductor, computer, consumer electronics, education, military/aerospace, automotive/industrial, and telecommunications.

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